ELECTRICAL REVIEW

Splendid Isolation

PUBLIC LIBRARY
DEC 6 1957
DETROIT

Attractively designed cover and cast iron case of the MEM Rotary Fused Isolator are finished in grey stove enamel

Handsome appearance and high efficiency go hand in hand here, in the MEM Rotary Fused Isolator.

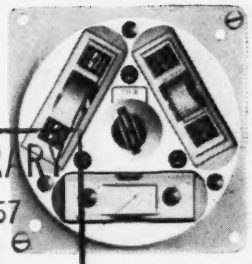
Designed for use with A.C. Motors on machine tools and other similar applications, this switch is of a slow break A.C. pattern rated at 15 amps., 500 volts. It will safely disconnect a stalled motor of 7½ h.p. taking six to eight times full load current.

The unit takes 15 amp., rewirable "Kantark Major" fuses or alternatively you can choose standard H.R.C. fuse links to the dimensions of B.S.88 1952, Appendix J.

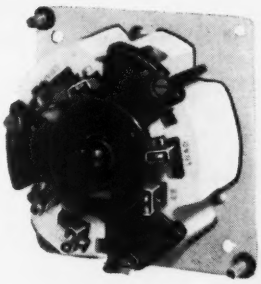
Fuses can be inspected or renewed in perfect safety. The cover can only be removed when the switch is in the 'off' position, and then the fuse contacts are completely isolated from the incoming supply.

Two patterns are available, for flush or surface mounting.

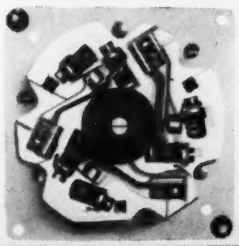
Send for illustrated leaflet No. 365(x)



Fuse inspection is absolutely safe. The fuse sockets are isolated by the removal of the cover and it is impossible to touch live metal.



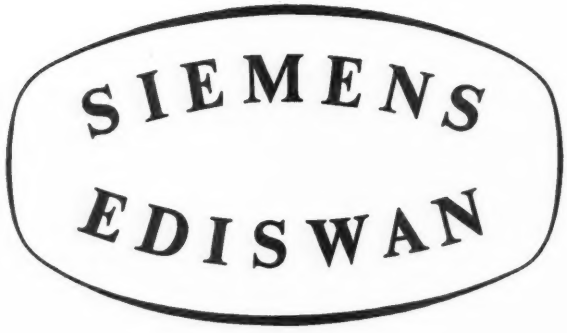
Wiring is especially easy. Heavy clamp terminals are provided and are clearly identified. An indicator shows whether the switch is on or off.



The three phases of the robust cam operated switch are separated by thick porcelain walls. Contacts are solid silver. Inspection is simple once the plastic switch cover is removed.

MEM

MILLAND ELECTRIC MANUFACTURING CO. LTD., TYSELEY, BIRMINGHAM 11



The trade mark of

SIEMENS EDISON SWAN LTD

The new Company with a Century of experience

Power Cables and Lines	Lamps and Lighting Fittings
Telephone Cable and Loading Coils	Electronic Control and Indication Equipment
Rubber and Plastic Cables	Accumulators and Batteries
Cable and Lighting Installations	Distribution Equipment
Public Telephones	Valves and Television Tubes
Private Telephones	Industrial Valves
Telecom Transmission Equipment	Radio Components
Marine Equipment	Wiring Accessories

SIEMENS EDISON SWAN LTD · An A.E.I. Company

CAXTON HOUSE · 8 TOTHILL STREET · WESTMINSTER · SW1 · Tel: WHITEHALL 2461

Also at 155 Charing Cross Road WC2 — 38, 39 Upper Thames Street EC4 and at Woolwich

District Offices and Branches throughout the country

This splendid new AVO Instrument has been developed to meet a definite demand for a sturdy pocket-size multi-range test meter at a modest price, suitable for use on modern electronic apparatus as well as for radio and television receivers, motor vehicles, and all kinds of domestic appliances and workshop equipment.

Readings are obtainable quickly and easily on a very open scale, and range selection is by means of a robust clearly marked rotary switch of the characteristic AvoMeter type. Measurements of A.C. and D.C. Voltage, D.C. Current, and Resistance are made by means of only two connection sockets.

19 Ranges

D.C. Voltage	A.C. Voltage
0— 100mV.	0— 10 V.
0— 2.5 V.	0— 25 V.
0— 10 V.	0— 100 V.
0— 25 V.	0— 250 V.
0— 100 V.	0— 1000 V.
0— 250 V.	
0— 1000 V.	

D.C. Current
0— 100μA
0— 1mA
0— 10mA
0— 100mA
0— 1 A

Resistance
0—20,000Ω
0—2 MΩ

Sensitivity:
10,000 Ω/V on D.C. voltage ranges.
1,000 „ „ A.C. „ „

Accuracy:
3% of full scale value on D.C.
4% „ „ „ „ „ A.C.

List Price: **£9/10s.**
complete with Test Leads and Clips
Size: 5⅞ x 3¾ x 1⅝ inches
Weight: 1 lb. approx.

THE MULTIMINOR

Leather Case if required **32/6**

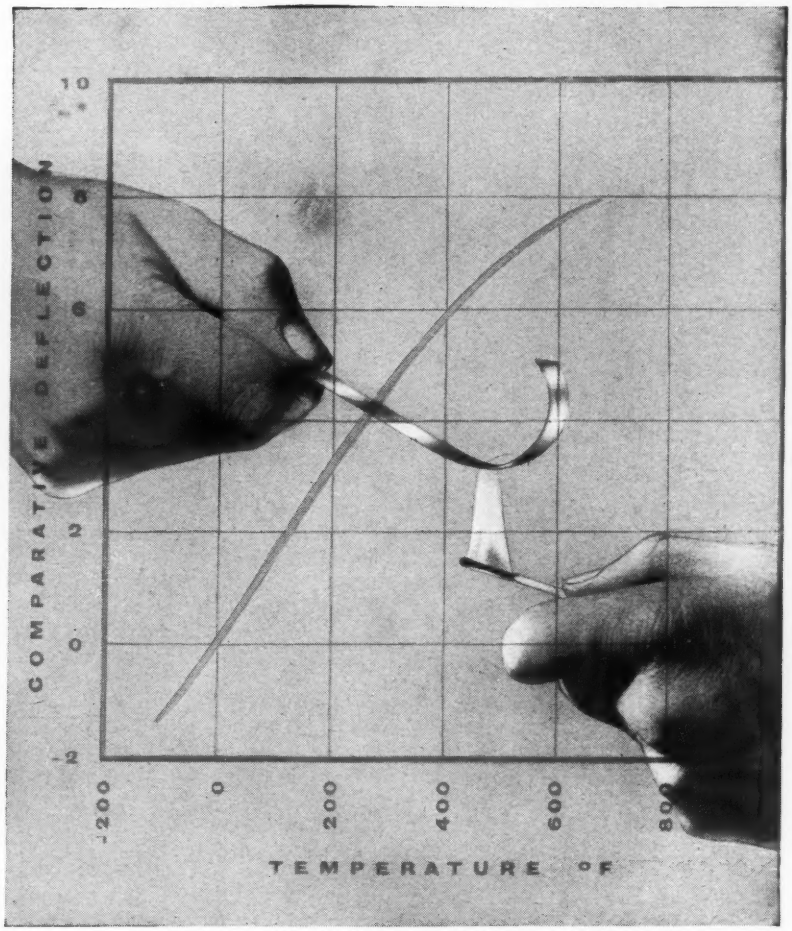
Designed and Manufactured by

AVO Ltd. AVOCET HOUSE · 92-96 VAUXHALL BRIDGE ROAD · LONDON · S.W.1 *VICtoria 3404 (9 lines)*

MM.2.

A

IS THIS THE BIMETAL IN YOUR AUTOMATIC CONTROLS?



A combined operation has produced the world's finest thermostatic bimetal

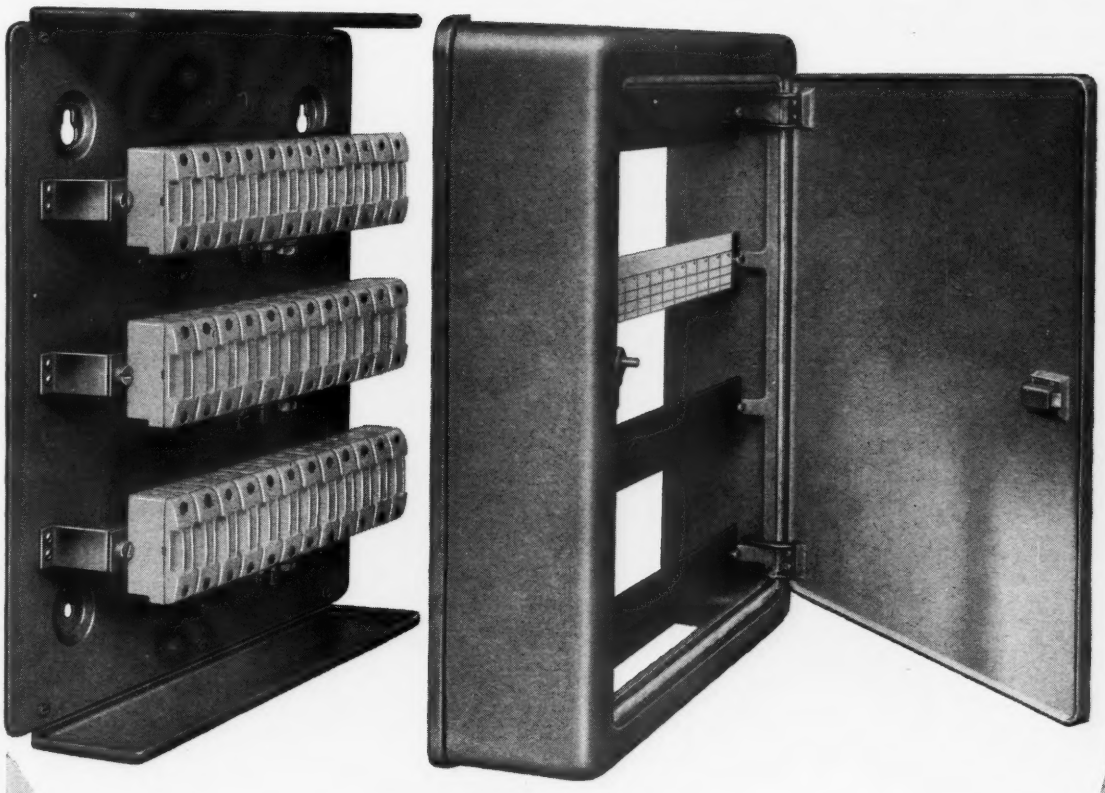
Around four thousand miles separate Manchester from Detroit in the United States. Far enough you might think to discourage much running to and fro. Yet so closely has British Driver-Harris collaborated with the W. M. Chace Company of America that we are now producing over here the world's finest thermostatic bimetal. It is available in all standard types for domestic and industrial applications. *Write to our Bimetal Section for Data Sheet No. 4 "Thermostatic Bimetal" which gives comprehensive technical information.*

Rigorous control of quality during manufacture, and thorough testing of the finished product, are fundamental to our process. The photograph on the left shows part of the Chemical Section of our Research and Testing Laboratories at Cheadle Heath, Cheshire.

BRITISH DRIVER-HARRIS CO LTD
MANCHESTER 15

ASSOCIATED PLANTS IN
UNITED STATES EIRE
FRANCE ITALY SPAIN

NICHROME



the ***NEW***

"SANDALINE"

SURFACE MOUNTING FUSEBOARDS

★ **EASY INSTALLATION**

★ **INTERCHANGEABLE H.R.C. OR REWIREABLE FUSES**

Send for leaflet 156/57

WM. SANDERS & CO. (WEDNESBURY) LTD.
WEDNESBURY · STAFFS

SANDERS
WEDNESBURY

Now what on earth, you may ask, have bluebells to do with batteries? Well... if you were with us in Alton this evening it would be easier to explain. That grizzled character at the end of the bar—the one with 'Prickly—handle with care' written all over him. Hard to picture him knee-deep in bluebells and picking like billy-oh. But that is how his father saw him, under the beeches in Dogford wood, some distant Sunday in May. As surely as he himself saw his own son—that chap by the dartboard, the one with the light ale. Dogford wood is an Alton custom—as old as the Hampshire hills. Life, do you see, still has continuity down here. Continuity in birthplaceand occupation. Continuity in manual skills and a man's solid pride in them. Continuity, as the years have proved, in the workmanship that Alton men put into Alton batteries.

ALTON *Batteries of Merit*

Alton stationary batteries: 10 to 15,000 ah. Also in regular production, renewal plates for all makes of battery, British and Continental.

THE ALTON BATTERY COMPANY LIMITED, ALTON, HANTS · Telephone: ALTON 2267 and 2268 · Telegrams: BATTERY, ALTON

A27

Tufnol Ltd.,

Perry Barr, Birmingham 22B,

announce that the word

TUFNOL

is their Registered Trade Mark

and the use by others of the word

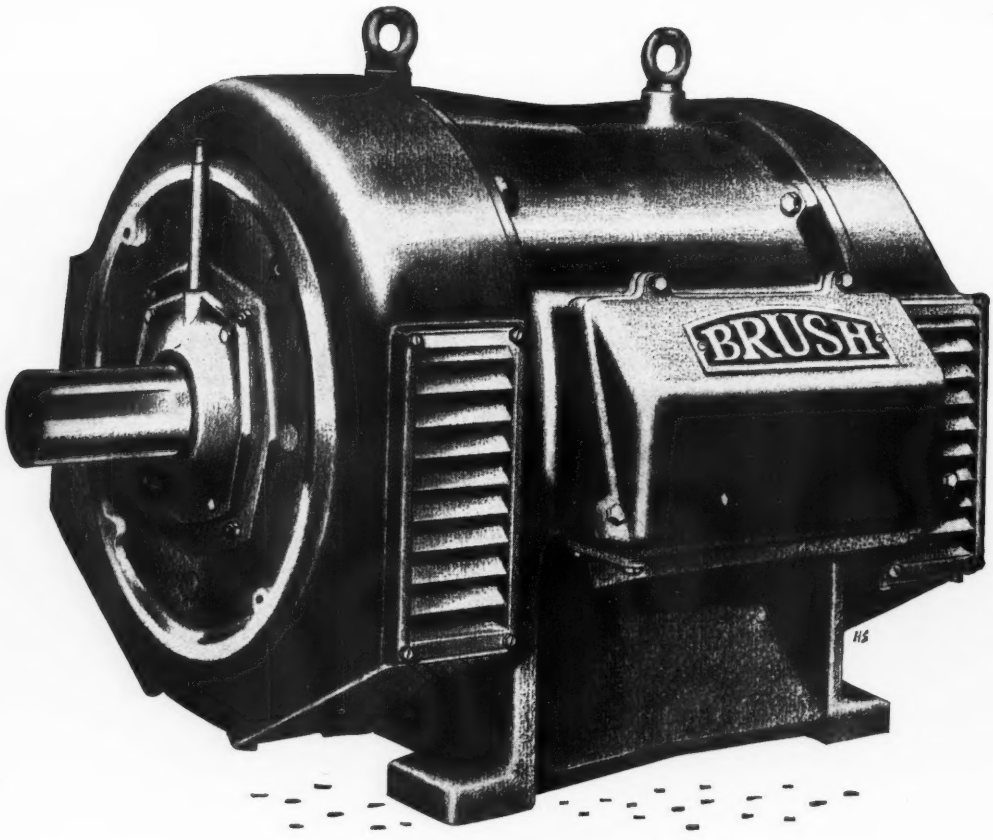
TUFNOL *in connection with*

products not made from material

supplied by Tufnol Ltd., is an

infringement of the

Trade Mark Registration.



But what's so special about this one?

On the face of it, it's just another electric motor, I know, sir.
But you see, being a BRUSH motor makes quite a difference.

Why? I'm afraid I can't see any difference.

Well, I suppose it's a matter of experience. These Brush people were among the first manufacturers of electric motors and such. And this experience shows—in the workmanship of even the smallest parts, and all the thousand-and-one details of the construction.

You mean a Brush motor is more reliable? And the firm will save money because of this?

Oh, absolutely. We'll get the maximum work out of it with the minimum of trouble. It'll give years of service, and maintenance will always be quick and easy because everything's so accessible and, well, so meticulously tested and . . .

All right! Say no more. I'm convinced. For once, we've done the right thing. It seems that everybody's going to be pleased the new machine is powered by Brush.

BRUSH
the power people

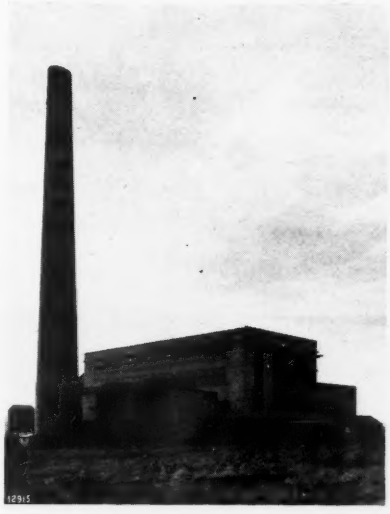
Write for literature on the type of power equipment you are interested in, to:

BRUSH ELECTRICAL ENGINEERING CO LTD · LOUGHBOROUGH · ENGLAND *Member of the Brush Group*

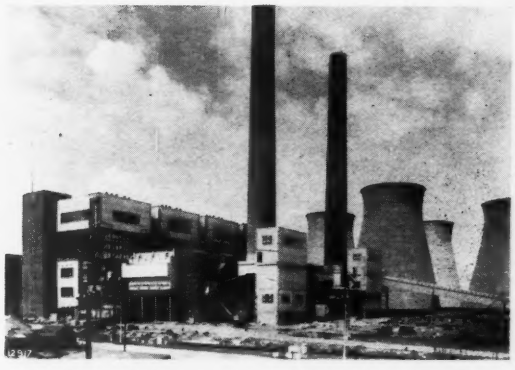
E.2

STURTEVANT
ELECTROSTATIC PRECIPITATORS

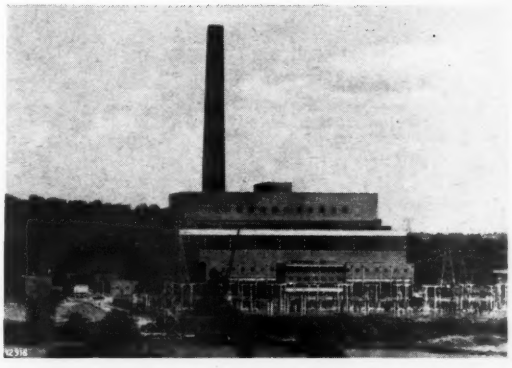
Are operating at...



BARONY



INCE



MEAFORD "B"

. . . and at many other power stations in this country and abroad.

Sturtevant make dry or irrigated precipitators of all types — tubular, plate, single or dual voltage with pre-ionisers — and Sturtevant Engineers are ready to collaborate in the application of this range of plant.

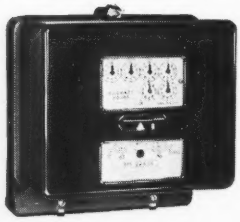
General technical particulars are given in our publication U7009 which is obtainable upon request.

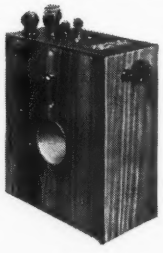
STURTEVANT ENGINEERING CO. LTD.

Southern House Cannon Street London E.C.4

AUSTRALIA: STURTEVANT ENGINEERING CO. (AUSTRALASIA) LTD. 400 SUSSEX STREET SYDNEY N.S.W.

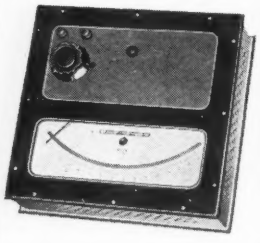
ELECTRICITY METERS





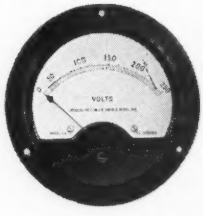
CURRENT TRANSFORMERS

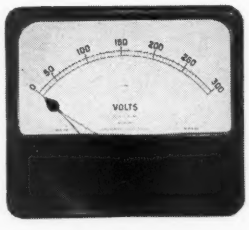
TIME SWITCHES



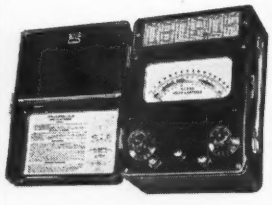
LABORATORY STANDARDS

PORTABLE INSTRUMENTS

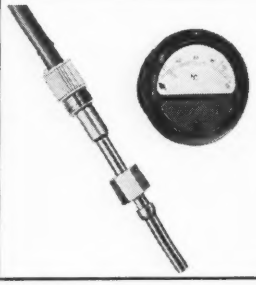




PANEL AND SWITCHBOARD INSTRUMENTS

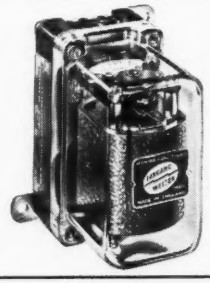


ALL-PURPOSE TEST INSTRUMENTS

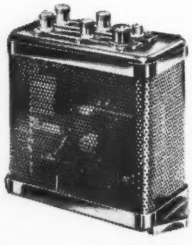


THERMOMETRY

AIRCRAFT INSTRUMENTS

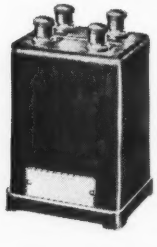


MOVING COIL RELAYS



ELECTRONIC MEASURING AIDS

ILLUMINATION METERS



WESTON STANDARD CELLS

PHOTO-ELECTRIC CELLS

SANGAMO WESTON LIMITED

ENFIELD, MIDDLESEX Tel: Enfield 3434 (6 lines) and 1242 (6 lines)
Grams: Sanwest, Enfield

SANGAMO WESTON

SCOTTISH FACTORY: PORT GLASGOW, RENFREWSHIRE
PORT GLASGOW 41151

Branches: London, Glasgow, Newcastle, Leeds
Manchester, Liverpool, Nottingham, Wolverhampton
Bristol, Southampton, Brighton

SW/8

Weekes

'SAFETEE' combined switchfuse with interlocked plug

- ★ Standard rating up to 500 amps, 500 volts A.C. or D.C.
- ★ Totally enclosed, watertight or weatherproof to order.
- ★ Quick break.
- ★ Fully interlocked.
- ★ Cartridge fuses.
- ★ Cable entries as required.

Weekes—
The SWITCH-GEAR and FUSE SPECIALISTS

Full details on request from:

L. WEEKES (LUTON) LIMITED

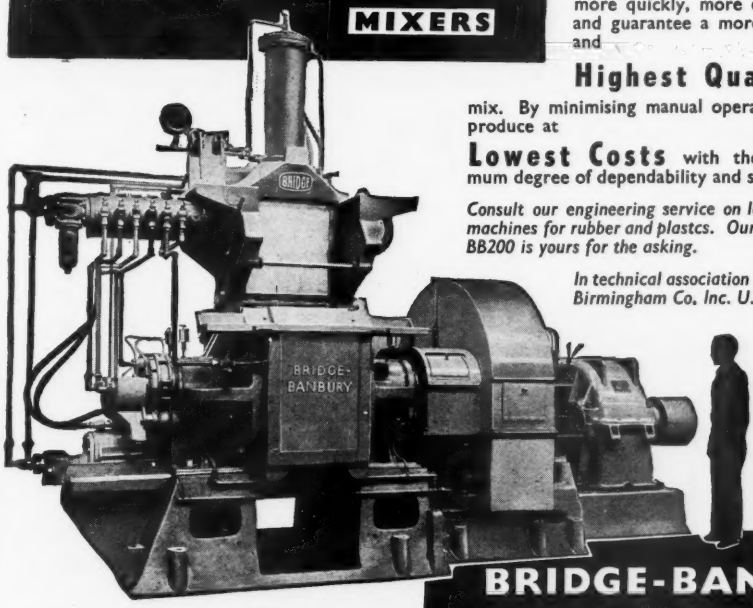
WINGATE ROAD • LUTON • BEDS
Tel.: LUTON 278 *Grams: "SAFETEE, LUTON"*

Bridge-Banbury MIXERS

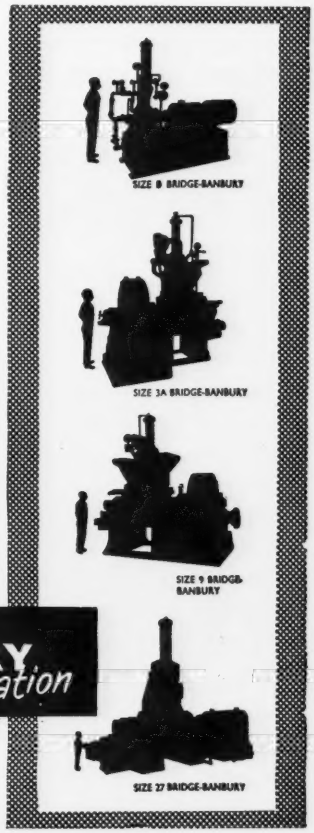
Produce the **Highest Output** more quickly, more efficiently, and guarantee a more uniform and **Highest Quality** mix. By minimising manual operating they produce at **Lowest Costs** with the maximum degree of dependability and safety.

Consult our engineering service on layouts and machines for rubber and plastcs. Our catalogue BB200 is yours for the asking.

In technical association with Farrel-Birmingham Co. Inc. U.S.A.



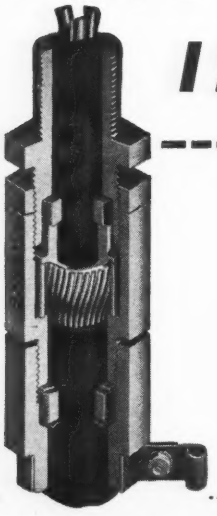
SIZE 11 BRIDGE–BANBURY



BRIDGE-BANBURY *Automation*

DAVID BRIDGE & CO. LTD., CASTLETON, ROCHDALE, LANCS
Phone: CASTLETON (ROCHDALE) 57216 Grams: Coupling Phone Castleton Lancs
LONDON OFFICE: BROUGHTON HOUSE, 6-7-8 SACKVILLE STREET, PICCADILLY, W.1
Phone: REGENT 7480 Grams and Cables: "EDERACEO" Piccy London

SINCE ONLY THE BEST IS GOOD ENOUGH...



the 'HAWKE' range of
cable glands now include
a patent earth clip
ensuring perfect safety

write for further details to—

HAWKE CABLE GLANDS LTD.
ASHWORTH STREET, DENTON, Lancashire
***Telephone:* DENTON 3868**

The new **Hawke**
a masterpiece in
GLAND design

for
MICANITE COIL SLOT *INSULATION*

Consult
EAST LONDON MICA WORKS
RINGWOOD RD., WALTHAMSTOW, LONDON, E.17
ESTD. 1912

Phone: **COPpermill 2248/9**
Telegrams: **Elmicmer, Easphone, London**

33 kV OUTDOOR AIR INSULATED SWITCHGEAR ERECTED IN 3 WEEKS

First day
Foundation frames laid ready to receive switchboard.

Third day *Showing sides, frames, and two of the busbar chambers in position.*

End of third week
Board fully erected and all breakers in position.

Shown here is a 7-panel, 33,000 volt air insulated, metalclad switchboard installed in the centre of a large industrial area in South Wales. It was completed ready for cabling in 3 weeks from the laying of foundation frames. The space required for this 7-panel board is only some 60 sq. yards compared with an equivalent conventional outdoor sub-station of some ten times this area.

S.W.S

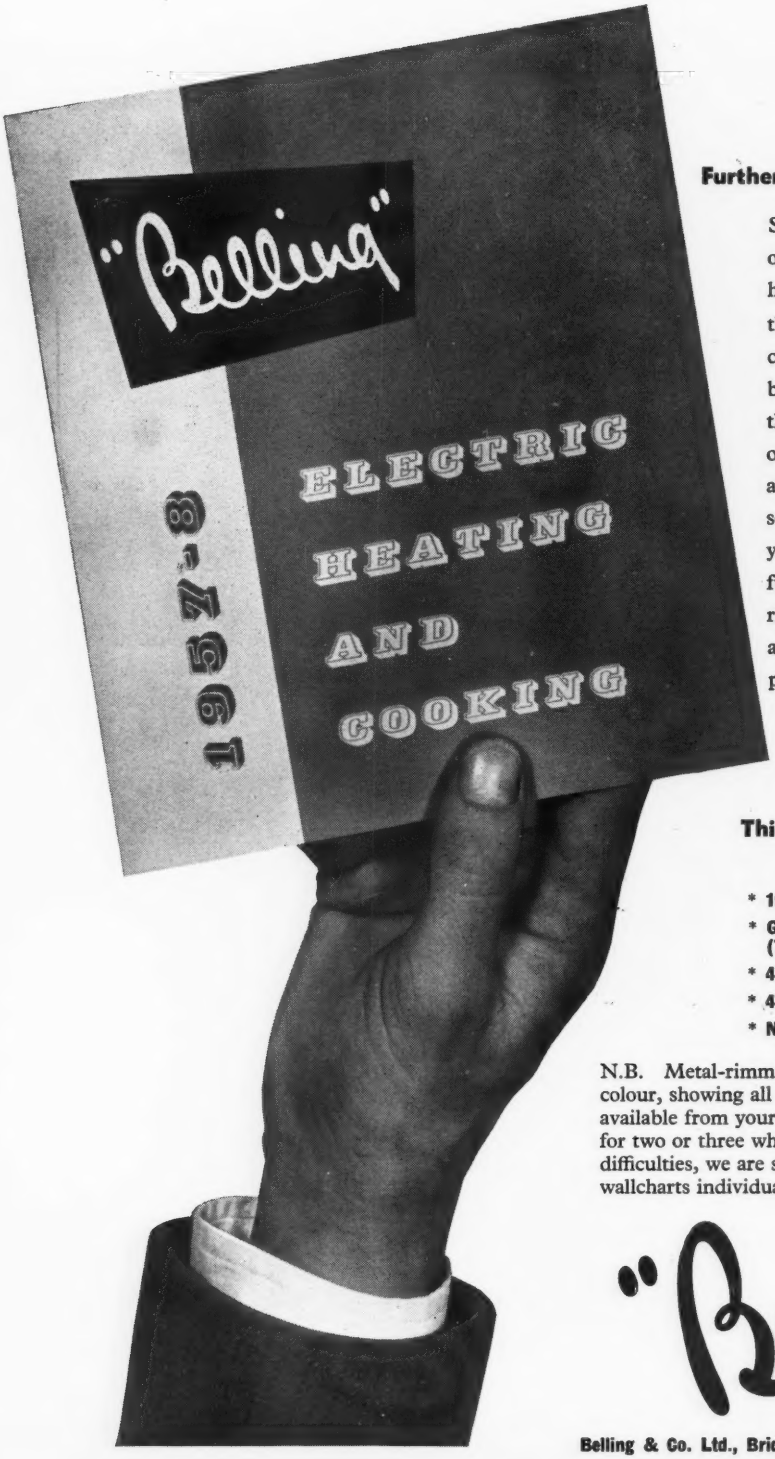
SOUTH WALES SWITCHGEAR LTD.

BLACKWOOD · MONMOUTHSHIRE · Works at BLACKWOOD and TREFOREST.

SWITCHGEAR, SWITCHFUSEGEAR, TRANSFORMERS, CONTROL BOARDS

TGA G21

Operation catalogue now completed!



Further liberal supplies available

Since 1st September, literally hundreds of thousands of catalogues and folders have been sent out to retailers all over the country. The demand for the new catalogue—generally regarded as the best we have issued—has been bigger than ever, so this has been a huge operation. According to our records, all requests have been met, but if by some mischance you haven't received your consignment (or you would like further supplies) please let us know right away. Further large quantities are coming in every day from our printers.

This full-colour sales literature is now in stock

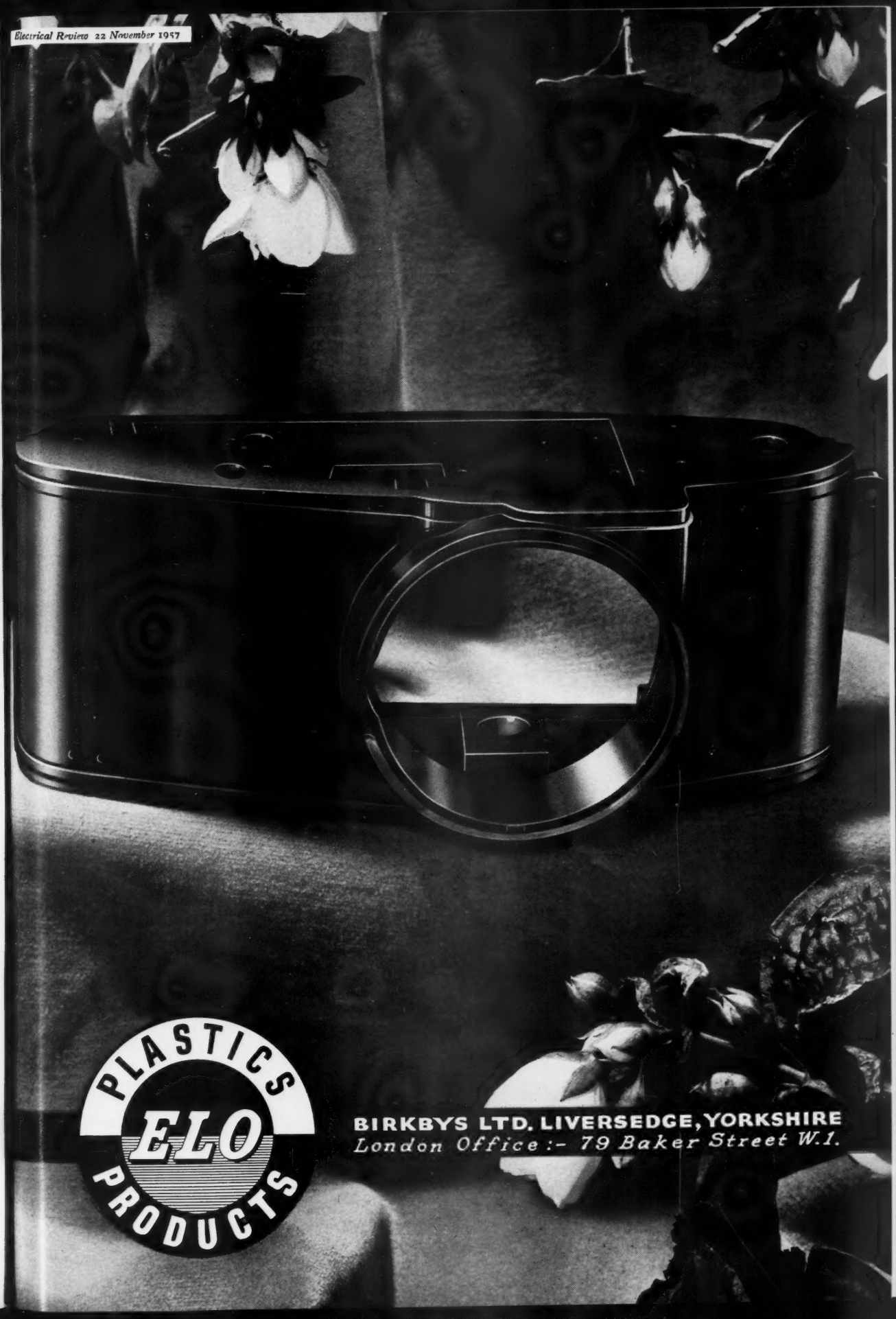
- **1957/58 56 page catalogues (8¼″ × 7¼″)**
- **General folder showing all our products (7¾″ × 4¼″)**
- **47AB Cooker folder (7¾″ × 8½″)**
- **47T Auto-Timer Cooker leaflet (7¾″ × 8½″)**
- **New spare parts list**

N.B. Metal-rimmed wallcharts (23″ × 17″) in full colour, showing all our products, will shortly be available from your wholesaler. Ask his representative for two or three when he calls. Because of packing difficulties, we are sorry that we cannot despatch wallcharts individually.

"Belling"

Belling & Co. Ltd., Bridge Works, Enfield, Middx. **HOWard 1212**

CRC 449


PLASTICS
ELO
PRODUCTS
BIRKBYS LTD. LIVERSEDGE, YORKSHIRE
London Office :- 79 Baker Street W.1.

Mr. Dealer says:—

Vactric

REGD.

the washing machine that sells itself!... because—

only Vactric has all the answers!

Women buy them and women use them because they know that it pays to use the best and today the saving of time, fatigue and money means so much. The fact that there are no extras, heaters, table tops, etc., all being included in the basic cost helps to make Vactric the quickest selling washing machine of the year.

- **Takes up only 20″ x 22″ floor space**
- **Glass fibre tub, complete with tub cover, takes 8/9 lb. wash, retains heat longer**
- **New 8 position 12″ power wringer FOLDS AWAY — no heavy lifting**
- **The new design agitator washes quickly but gently — can't harm clothes**
- **Power pump empties 10 gallons in 2½ minutes**
- **All gears are sealed, need no attention**
- **Cleanline cabinet, all controls are recessed**
- **Four special castors for easy movement**

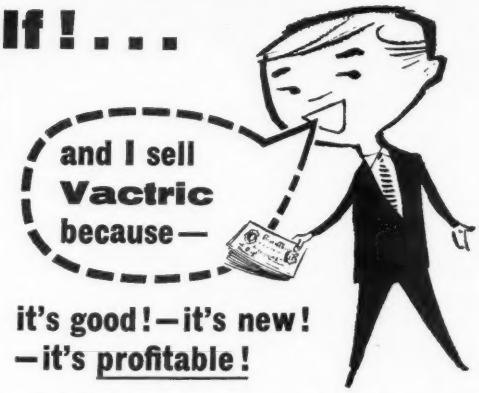
All these points make for efficiency, saving and good washing. The streamline finish — cream or white — completes a formidable list of selling points.

Retail price including Purchase Tax

75 gns

EASY TERMS AVAILABLE

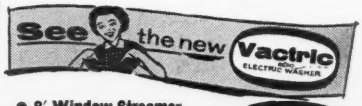
and there's a **TWO YEAR** *Guarantee* with every machine



it's good!—it's new! —it's profitable!

Only Vactric give such a generous trade discount, the best there is! With many unique sales features, and giving such excellent profit and, of course, the fact that it's always easier to sell something that is so up-to-date that it creates interest. The Vactric *all* electric washing machine really is the answer to the busy woman's laundry problems, which means that half one's selling job is done by the quality of the machine.

Make a display with these sales aids — Free to you!



- 8′ Window Streamer
- Clip-on showcard
- Attractive full colour Brochures.

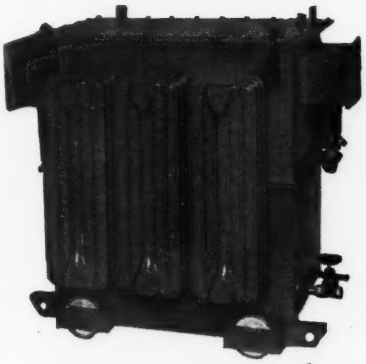
BIG profits... when you sell— **EASY sales...**

THE Vactric REGD. ELECTRIC WASHER

* Send for the Salesman's manual and other literature, display material, etc. —FREE—from THE SALES MANAGER:- VACTRIC LIMITED, 196 SLOANE STREET. LONDON, S.W.1.

A1967

It's a **STURDY** *transformer . . .*



OVER
25 YEARS'
MANUFACTURING
EXPERIENCE

. . . in more ways than one

As supplied to Govt. Depts., National Coal Board, C.E.A. and many other large industrial undertakings.
From 500 VA to 100 kVA with special emphasis on the range 5 kVA to 100 kVA.

Sturdy ELECTRIC CO. LTD.

STURDY WORKS, HAMSTERLEY COLLIERY, NEWCASTLE-ON-TYNE
Phone: EBCHESTER 271

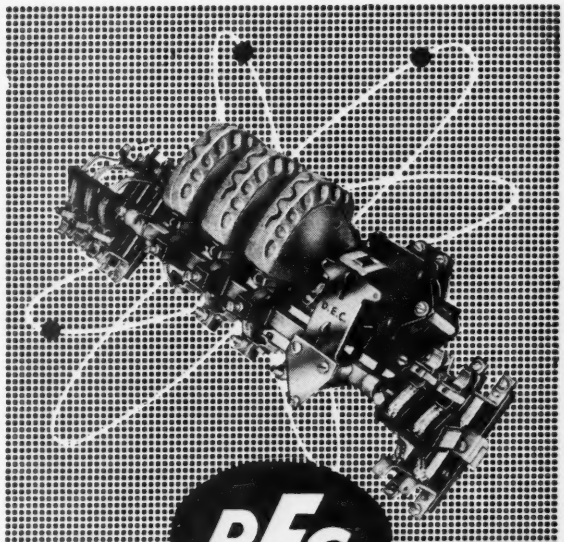
THE MERITUS

HIGH CURRENT NEUTRAL LOOP IMPEDANCE AND CONTINUITY TESTER

SHOCKPROOF AND SAFE
FOR OPERATOR AND INSTRUMENT

This instrument will SAFELY carry out tests on electrical installations and appliances as recommended in the I.E.E. Regulations, 13th Edition, 1955, Section 5.

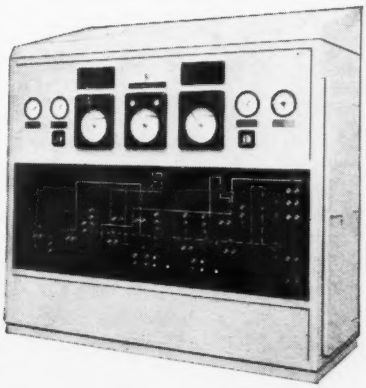
MERITUS (BARNET) LTD.
BARNET, HERTS. **Bar. 2291/2**



DEC

THE
ULTIMATE CONTROL

CENTRALISED MOTOR STARTING UNITS.
AUTOMATIC OPERATIONAL CONTROL.
COMBINED INSTRUMENTATION PANELS.
CONTACTOR SWITCHGEAR TO 1600 A.



COMBINED INSTRUMENTATION PANEL FOR THE CLAYTON ANILINE COMPANY LIMITED, MANCHESTER.

DANE ELECTRICAL
CONTROLS LIMITED,
DENTON, MANCHESTER.
Tel.: DENTON 2681.

CW 4389/AM

Winter

plays havoc with electrical installations

—so test NOW with a

MEGGER
TRADE MARK

Insulation Tester and insure against breakdown

Please write for publications

EJ 291.....Insulation Tester Series 1
EJ 317.....Insulation Tester Series 2
EJ 200.....Insulation Tester Series 3
EJ 238.....Insulation Tester Series 4

INSTRUMENTS DIVISION
EVERSHED & VIGNOLES LIMITED
CHISWICK · LONDON W.4
Telephone: Chiswick 3670
Telegrams and Cables: MEGGER, LONDON, TELEX

EVERSHED SERVES INDUSTRY
7/56

at £14/19/0 thousands more of your customers can afford

THE *'Ladybird'*

PERFECT FULL SIZED ELECTRIC
FLOOR POLISHER

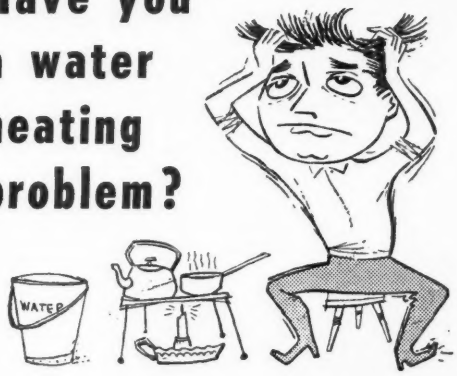
at £14/19/0 we give you the BIGGEST PROFIT PERCENTAGE of all

No other electric floor polisher opens up the market to thousands of housewives who otherwise could not hope to possess an electric floor polisher. *Remember* the 'Ladybird' is full-sized with full-sized brushes. *No maintenance*; only replacement of worn-out parts after years of trouble-free service. Easy and light to handle, easy to stow away. Stock NOW; price tells, price sells all-the-year round.

CHRISTMAS ADVERTISING. See 'Ladybird' price-compelling advertisements in Women's Magazines. Write for details and trade terms to:—

LADYBIRD APPLIANCES LTD., Dept. 6, Reliance Works, Oxford Rd., Wokingham, Berks. Tel.: Wokingham 238. Grams, Cables: AMILAWN, Wokingham

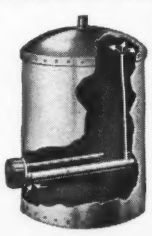
Have you a water heating problem?



. . . solve it with "DUNLOW" Electric Immersion Heaters and Circulators. Side Entry, Top Entry and External Types can be supplied. Full information on request.

The easiest heater to fit.

Side Fixing Type Circulator with mechanical flange, 2, 3 and 4 kW.



DUNCAN LOW LIMITED
57/61 TROSSACHS ST. GLASGOW, N.W.

'Phone: Douglas 6051/2/3
Grams: Immerser, Glasgow

Coreless Shielded REACTORS

Group of three single-phase reactors for a 90-MVA 132-kV Power link at a British Grid substation.

Three of 91 single-phase reactors for a 15-MVA 33-kV system at a power station in Australia

- **limit short-circuit currents**
- **maintain stability**
- **effect economies in switchgear**

These simple and robust METROVICK oil-immersed units are used extensively on power station busbars, and transmission and distribution systems. Unlike the core-type reactors which may reach saturation at higher currents, Metropolitan-Vickers coreless reactors have a straight line volt/ampere characteristic up to their maximum short-circuit rating.
Both single and three-phase types are supplied to cover a very wide range of current ratings.

* *Please write for descriptive leaflet* 379/1-1

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

An A.E.I. Company

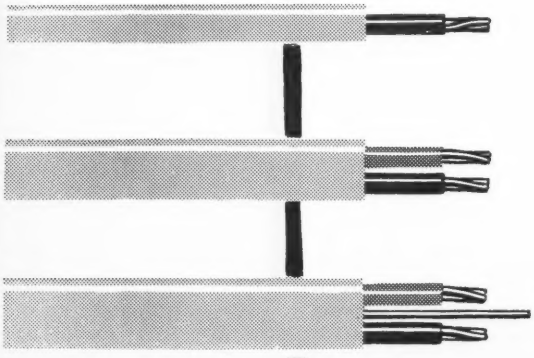
Leading Electrical Progress

E/A 501

A 18

POLYTHENE

INSULATED & P.V.C. SHEATHED CABLES



Single core, twin core and twin core and earth cables are now being supplied in a range to cover all normal wiring applications. The combined use of Polythene and P.V.C. provides resistance to oil, corrosion and flame propagation. These cables conform with BS. 1557.

CONNOLLYS

CERTIFICATION MARK

Founder Members of the C.M.A.

CONNOLLYS (BLACKLEY) LTD

HEAD OFFICE: MANCHESTER, 9. Phone: CHEetham Hill 1801. Grams: "Connollys, Blackley"

BRANCH SALES OFFICES AND STORES:

LONDON: 23 Starcross Street, N.W.1. Telephone: Euston 6122. Telephone: Victoria 4991/2. Telex 33-309. **BIRMINGHAM:** 39/44 Watery Lane, Bordesley, Birmingham 9. **GLASGOW:** 73 Robertson Street, C.2 Telephone: Central 3662

PRECIOUS METAL
CONTACTS & ASSEMBLIES
Every 'Baker' contact is perfectly accurate in dimensions and bears a superfine finish. Illustrated is a selection from the many types of contacts and assemblies we manufacture. Composite and laminated type contacts can be supplied in any form to suit assembly requirements.
Our Technical Department is at your service to assist in the selection of a contact material ensuring economy and efficiency
BAKER PLATINUM DIVISION
Engelhard Industries Ltd
52 HIGH HOLBORN · LONDON · WC1
Telephone: CHAncery 8711

★More and more people are using...

The Grubb

ALL ELECTRIC
De-MISTER UNIT

THE SUPER CHROME FINISH ADDS TO WINDOW DISPLAY

- SUITABLE FOR A.C. OR D.C. INSTALLATION
- A PLUG-IN INSTALLATION ONLY
- VOLTAGE - 200/250v. PROVISION FOR EARTHING
- VERY LOW RUNNING COST

APPLY FOR CATALOGUES AND PRICE LISTS TO....

GRUBB ENGINEERING COMPANY LIMITED
MARY STREET • BIRMINGHAM 12

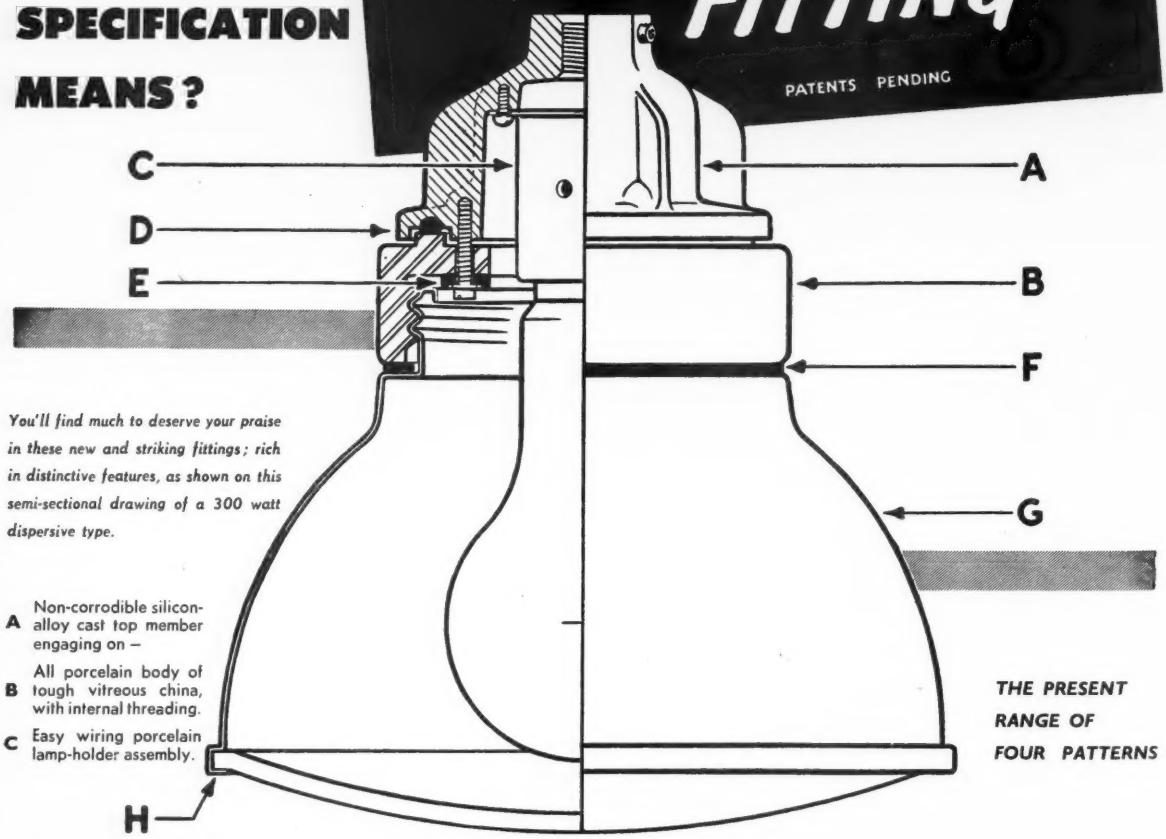
It's well worth looking into!

The R.E.A.L.

NON – CORRODIBLE 'REFLECTORTIGHT' FITTING

PATENTS PENDING

DO YOU REALISE WHAT THIS SPECIFICATION MEANS?



You'll find much to deserve your praise in these new and striking fittings; rich in distinctive features, as shown on this semi-sectional drawing of a 300 watt dispersive type.

A Non-corrodible silicon-alloy cast top member engaging on –

B All porcelain body of tough vitreous china, with internal threading.

C Easy wiring porcelain lamp-holder assembly.

D Gastight and dust-tight joint between top member and porcelain body.

E Silicon-alloy supporting ring reinforcing 3-point fixing of porcelain body to top member.

F Bonded cork gasket providing positive joint between porcelain body and –

G Screw neck reflector of heavy gauge aluminium, specially treated.

H Heavy section pressed heat-resisting glass dome, permanently sealed in position at mouth of reflector.

THE PRESENT RANGE OF FOUR PATTERNS

List No.	Description	Lamp Size
1090	Dispersive 10" dia.	100 watt
1093	Concentrating 8" dia.	100 watt
2000	Dispersive 12" dia.	200 watt
2010	Dispersive 12" dia.	300 watt

Publication No. P5601 gives full details of this new range

Issued by ROWLANDS ELECTRICAL ACCESSORIES LTD., R.E.A.L. WORKS, BIRMINGHAM 18

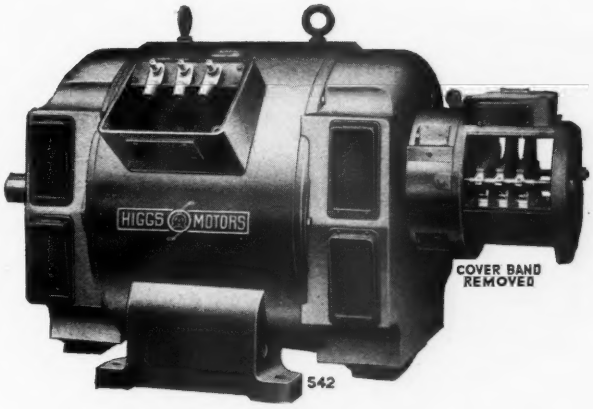
TRADE

HIGGS MOTORS LTD.

MANAGING DIRECTOR DAVID C.Y. HIGGS, A.M.I.E.E.

MARK

BIRMINGHAM 6 ENGLAND



HIGGS SLIP-RING MOTORS UP TO 1000 H.P.

GUARANTEED FOR EVER

Belfast • Bristol • Cardiff • Dundee • Glasgow • Hull • Leeds • Liverpool
London • Manchester • Newcastle • Peterborough • Sheffield • Wolverhampton

play safe . . .

. . . We don't like to harp on this question, but Connollys Winding Wires are second to none.

If you want a wire which proves trouble-free in winding and does its job really efficiently, year in, year out—you'll be wise to insist on Connollys.

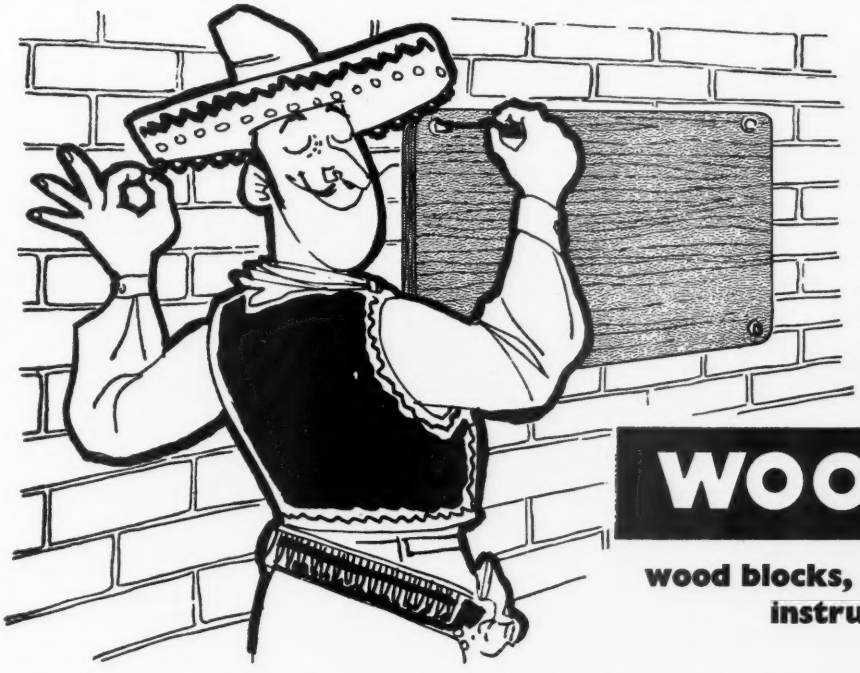
Your free copy of Connollys oil-base Enamelled Wire catalogue will be sent on request.

CONNOLLYS (BLACKLEY) LTD
KIRKBY INDUSTRIAL ESTATE · LIVERPOOL

Phone: SIMonswood 2664. Telex No. 62-247. Grams: "SYLLONNOC. LIVERPOOL—Telex." *Branch Sales Offices:* SOUTHERN SALES OFFICE AND STORES: 23 Starcross Street, London, N.W.1. Phone: EUSton 6122. MIDLAND SALES OFFICE AND STORES: 39/44 Watery Lane, Bordesley. Birmingham 9. Phone: VICtoria 4991. Telex No. 33-309.

THE LARGEST MANUFACTURERS OF FINE ENAMELLED WIRE IN THE WORLD

METER BOARDS all over the world



and in all climates

"Si-Señor ! I usa da Wootton Meter Board every time. Da wood is what the Breetish call ze best tested plywood. And they send youse orders pronto— nevair Mañana ! Olé !"

WOOTTON

wood blocks, sunk switch boxes, instrument cases

WOOTTON & CO. LTD • ALMA WORKS • PONDERS END • MIDDLESEX • *Tel.: Howard* 1858

Versatile HEAVY DUTY BOX FURNACES BY HEDIN

These furnaces are true maids-of-all-work. They are ideal for vitreous enamelling, annealing, case hardening, normalising, stress-relieving, or any metallurgical process. Fitted with atmosphere or vacuum containers they are equally good for bright annealing, degassing, copper brazing, sintering, etc.

- Maximum temperature 1150°C.
- Elements fitted in door, as well as walls, to ensure even temperature. Arranged for rapid heating
- Non-distorting hearth
- Highly efficient thermal insulation.
- Automatic temperature control
- Safety devices to cover all contingencies
- Easy maintenance

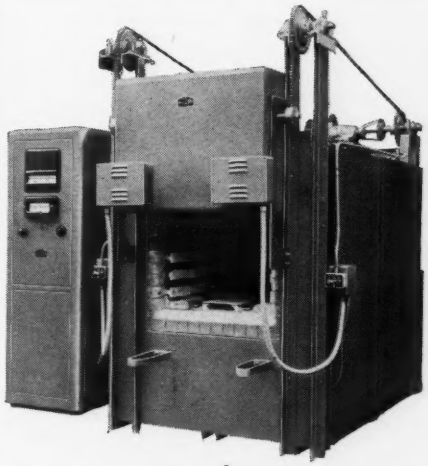
THE HEDIN RANGE OF FURNACES

Aluminium Brazing, continuous or batch; Aluminium Melting, bale-out or tilting; Sintering, to suit all temperatures; Continuous or batch annealing, with or without atmospheres; Forced Air Circulating; Steam atmosphere, arranged for rapid quenching; Special tungsten furnaces up to 2500 deg.C.; Glass annealing lehrs, continuous or batch; Ceramic Kilns up to 1400 deg.C., tunnel or batch; Carbon resistor furnaces up to 3000 deg.C.

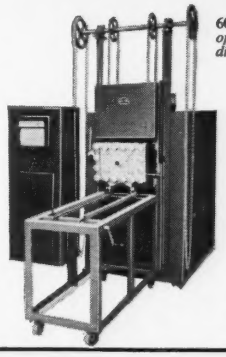
We shall be glad to send you full details of any of our furnaces on request.

HEDIN LIMITED INDUSTRIAL HEATING SPECIALISTS

Commerce Estate, S. Woodford, London, E.18. *Tel.: BUCkhurst 6601-2*



60 KW mechanically-operated model. Internal dimensions 54" × 24" × 18"



Hand-operated model, fitted with self-contained atmosphere equipment. With two or more containers the furnace can be kept in continuous production.

*REGD. TRADE-MARKS

*ZENITH

NEW and IMPROVED

*"VARIACS"

at REDUCED PRICES!

Due to increased demand, up-to-date design practice and modern production methods, we are able to announce substantial *price reductions* on most "VARIAC" models.

A new comprehensive catalogue covering over 170 models is now available and will gladly be forwarded on request.

All "VARIAC"-*DURATRAK Transformers have a brush track treated in accordance with British Patent No. 693406, which produces a coating of precious metal alloy on the brush track surface, eliminating the possibility of deterioration due to oxydization, and reducing contact resistance. "VARIACS" with DURATRAK have longer life, increased overload capacity and maximum economy in maintenance.

The ZENITH ELECTRIC CO. Ltd.

ZENITH WORKS, VILLIERS ROAD

WILLESDEN GREEN, LONDON, N.W.2

Telephone: WILlesden 6581-5 Telegrams: Voltaohm, Norphone, London

AGRO ELECTRICAL CO. LTD., 60-66 WARDOUR ST., LONDON, W.1. Phone: GERrard 0721/2. Works: AYLESBURY, BUCKS.

CONSOLIDATED
PNEUMATIC
MAKE OVER 480
DIFFERENT MODELS
OF POWER TOOLS

This is the C.P. SUPERSONIC SCREWDRIVER

IT IS THE QUIETEST AIR-POWERED SCREWDRIVER IN THE WORLD!

The C.P.—3008 screwdriver is a really effective step forward in overcoming production and assembly shop noise. It has a supersonic exhaust—the exhaust sound waves have been raised to a frequency higher than that audible to the human ear. Other efficiency features are—clutch, adjustable without the use of tools: built-in speed control; directional exhaust; all steel construction; weight less than 2 lbs; length only 9 inches; full line of accessories. Write SP426 on a postcard for full details.

Consolidated Pneumatic

CONSOLIDATED PNEUMATIC TOOL CO. LTD. 232 DAWES ROAD, LONDON, S.W.6.

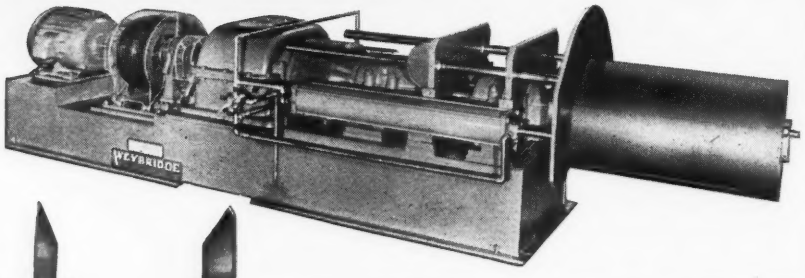
CP104

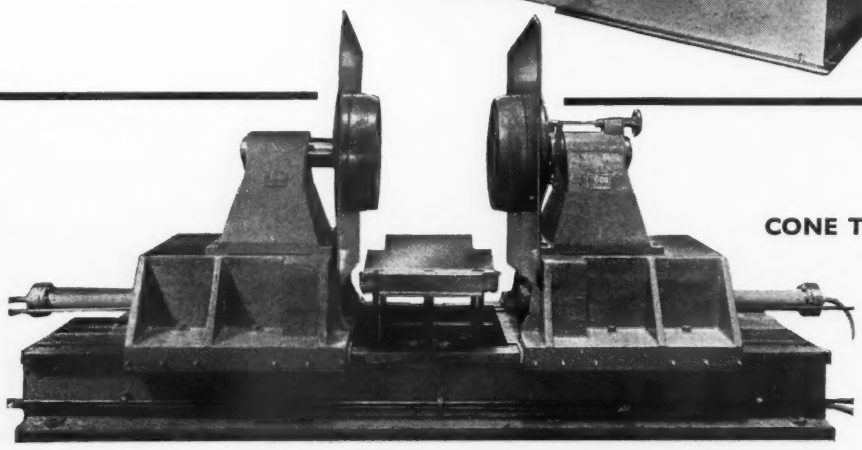
AIR COMPRESSORS · PNEUMATIC TOOLS · ELECTRIC TOOLS · CONTRACTORS EQUIPMENT · ROCK DRILLS · PUMPS · DIAMOND DRILLS

Weybridge

GANG SLITTING MACHINERY

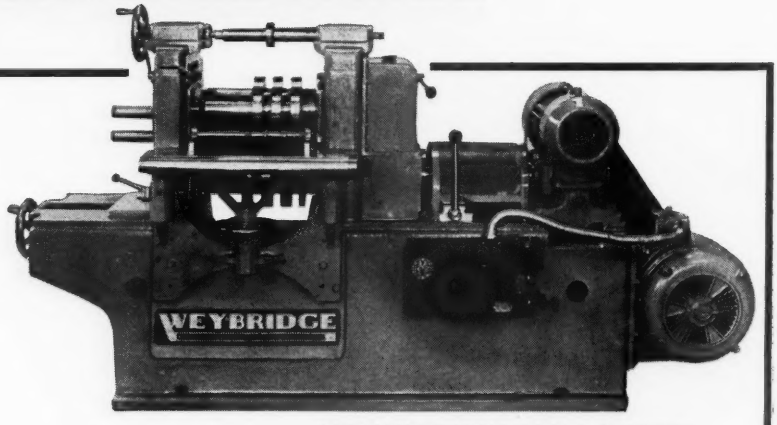
RECOILING UNIT WITH PNEUMATIC EXTRACTION





CONE TYPE DECOILER WITH HYDRAULIC ADJUSTMENT

If you are interested in Gang Slitting of any description our technical representative will gladly visit you on request to discuss your requirements.



MEDIUM DUTY GANG SLITTER with ADJUSTABLE CUTTER SHAFT

Sole World Agents

GEORGE COHEN

SONS AND COMPANY LIMITED

Sunbeam Road, London, N.W.10 — 'Phone: Elgar 7222/7

Stanningley, Nr. Leeds — 'Phone: Pudsey 2241

Kingsbury (Nr. Tamworth) · Manchester · Glasgow · Swansea · Newcastle-on-Tyne · Sheffield
Southampton · Belfast · Bath

THE 600 GROUP OF COMPANIES

can be safely entrusted to...

AXON

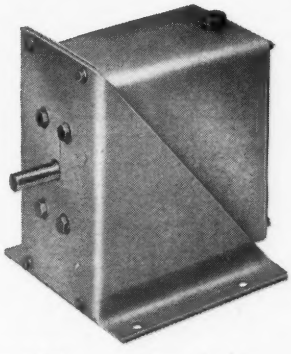
AXON MOTOR RE-WINDING CO LTD

536 MOSELEY ROAD
BIRMINGHAM 12

Tel.: CALthorpe 0774

JOHN MORRIS
ELECTRICAL ENGINEERING CO. LTD.
BILSTON TEL. 41237-8 STAFFS

CENTRIFUGAL SWITCHES



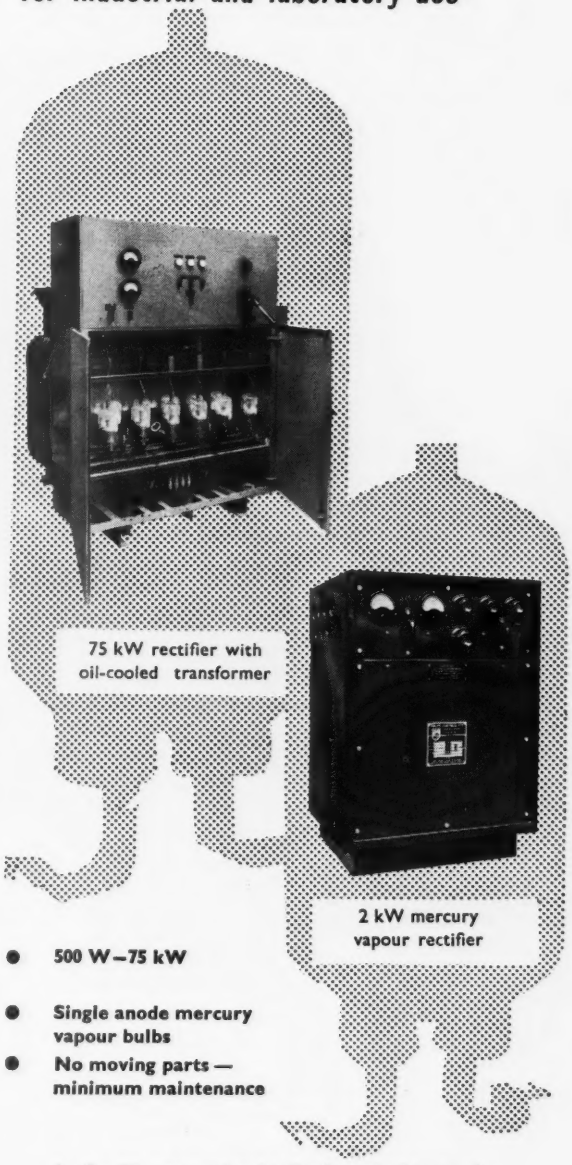
Available as single, double and triple gang units

Range 150/3000 r.p.m.

Ask for Leaflet CS290457

Electronic Rectifiers

for industrial and laboratory use



- 500 W–75 kW
- Single anode mercury vapour bulbs
- No moving parts — minimum maintenance

Leaflet PI 4474, giving details of standard range of Philips Electronic Rectifiers, gladly sent on request.

Rectifiers can also be made to individual requirements, e.g. to fit in with site conditions. Technicians will visit your premises and advise without obligation on suitable equipment. Please contact:-

Research and Control Instruments Division

PHILIPS ELECTRICAL LTD

CENTURY HOUSE
SHAFTESBURY AVENUE · LONDON · WC2

(PIO197A)

BUCK & HICKMAN LTD
ARE LARGE STOCKISTS OF

B
T-H

ELECTRIC MOTORS

24 hour delivery service

COMPREHENSIVE STOCKS INCLUDE

¼—5 H.P. SINGLE PHASE—SPLIT PHASE CAPACITOR — REPULSION

¼—25 H.P. THREE PHASE · SCREEN PROTECTED & TOTALLY ENCLOSED

⅛—1 H.P. DIRECT CURRENT 110-200-250 VOLT

Please quote reference DC/ER

HEAD OFFICE: 26 WHITECHAPEL ROAD · LONDON · E.1

BRANCHES: ALPERTON · BIRMINGHAM · GLASGOW · LEEDS · MANCHESTER · WATFORD

Mercury switches

THE MERCURY SWITCH MANUFACTURING COMPANY LIMITED are the largest specialised manufacturers of Mercury Switches in Great Britain. These are made to exceptionally high and uniform standards of quality.
Since its inception in 1932, this Company has concentrated solely on the production of Mercury Switches. It has thereby obtained the widest possible experience and expert knowledge of design, manufacture and application.

THE MERCURY SWITCH MANUFACTURING COMPANY LIMITED
WEST DRAYTON • MIDDLESEX

MS 12

FOR ANYTHING IN

MICA — Moulding, Commutator, Flexible, Heat-resisting Qualities, Commutator Rings, Spools, Tubes, etc.

MICANITE — Mouldings of any shape or form, Tubes, Plates, Washers, Sheets in all thicknesses, etc.

BAKELITE — Natural in all Grades and Qualities, Stove Micas, Plates, Washers, Commutator Segments, Condenser Films, etc.

Send to the Manufacturers:

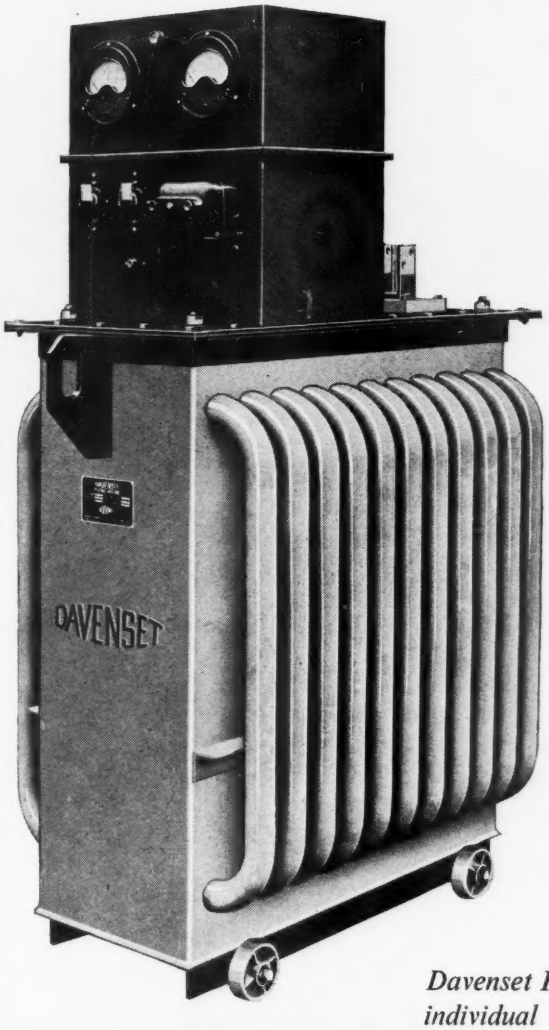
THE BIRMINGHAM MICA CO. LTD.
South Road • Hockley • Birmingham
Phone: Northern 5631/2 Telegrams: "Insulation, Phone, Birmingham"

METAL SPINNINGS
by
LEE AND WILKES LTD
IN ANY METAL
UP TO 7 FEET DIAMETER

SANE PRICES
DEPENDABLE
DELIVERIES
QUALITY
PRODUCTS

LEE AND WILKES LTD
BREWERY ST. BIRMINGHAM 6.

Power for plating



- No maintenance of any type needed.
- No moving parts to break down
- Close control of plating voltage by transformer tapping switches

- Simple to install alongside bath
- No rheostats to wear out
- Conservatively rated for continuous duty at full load

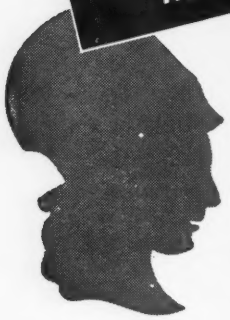
- Low in price—high in efficiency
- Popular sizes always in stock
- Quick delivery

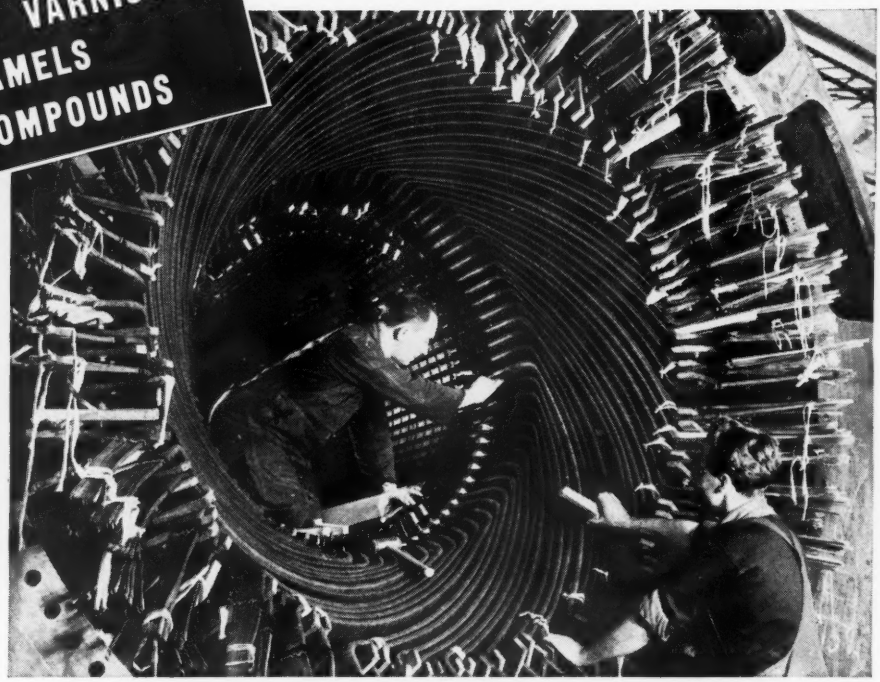
Davenset Plating Rectifiers are being used extensively as individual units or in banks in the U.K. and overseas

DAVENSET TRANSFORMER RECTIFIER SETS
for **CONTINUOUS DUTY AT FULL LOAD**

PARTRIDGE WILSON & CO. LTD • LEICESTER • ENGLAND

MINERVA
INSULATING VARNISHES ENAMELS AND COMPOUNDS





A Stator under construction

By kind permission of C. A. PARSONS & CO. LTD. Newcastle-on-Tyne.

We are constantly developing Special Varnishes to meet the many and varied requirements of the Electrical Industry. The tendency has been to concentrate on the development of Varnishes utilising Synthetic Resins. The advent of these Synthetic Types of Insulating Varnishes which have been developed by constant research over many years in our Chemical, Electrical and Physical Laboratories has enabled us to produce Insulating Varnishes to meet the most exacting requirements set by the Electrical Industry, thereby maintaining the high reputation and standard of 'MINERVA' Insulating Products.

Catalogue post free

STOVING VARNISHES (Natural Resin Type)
STOVING VARNISHES (Synthetic Resin Type)
THERMO-SETTING VARNISHES
SOLVENTLESS VARNISHES
AIR-DRYING VARNISHES
CLOTH VARNISHES
CORE-PLATE VARNISHES (Stoving and Air-Drying)
COPPER WIRE ENAMELS (Oleo-resinous and Synthetic Types)
All the above are supplied in black and clear.
ACID & HEAT RESISTING ENAMELS
Available in all colours
MICA BONDING VARNISHES
COIL STICKING VARNISHES
SLEEVING VARNISHES (Black, Clear and Colours)
CABLE LACQUERS (Non-flam., Cellulose Type and P.V.C.)
COMPOUNDS (Various Types)

All the materials listed conform to B.S. Specifications wherever applicable

Pinchin, Johnson & Co.

4 CARLTON GARDENS, LONDON, S.W.1

Telephone: TRAfalgar 5600

Branches: BELFAST, BIRMINGHAM, BOOTLE, BRIGHTON, BRISTOL, GLASGOW, LEEDS, MANCHESTER, NEWCASTLE-ON-TYNE & SOUTHAMPTON

EARTH LEAKAGE RELAY

Containing a large robust moving coil movement. Magnet assisted positive action make or break contact at 100 milliamps – 600 volts. Hand release.

THE ELECTRICAL INSTRUMENT CO. (HILLINGTON) LTD.

47 Boswell Square, Hillington, Glasgow, S.W.2

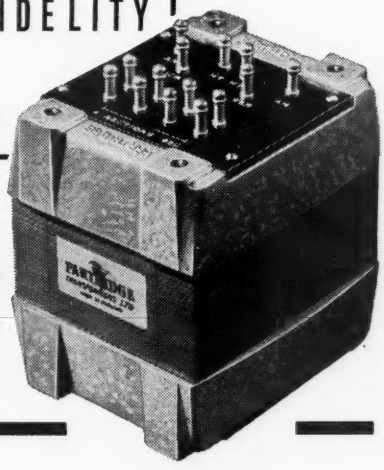
Telephone: Halfway 1166 *Telegrams: ELINCO*

A new range of HIGH FIDELITY output transformers

The PARTRIDGE

P5000

SERIES



A range of truly "high fidelity" output transformers with superior performance—yet economical design has enabled a price reduction over transformers with less exacting specification. These transformers are especially suited to the well-known Osram and Mullard amplifier designs. The primaries are tapped for ultra linear connection at 43%, and on certain models at 20%, to give optimum performance at various power levels up to 50 watts for operation with such valves as KT88, KT66, EL34, N709, EL84, etc.

The series includes a mains transformer of similar styling with specification to suit the Mullard 5-10 and Osram 912 amplifiers.

Data sheets and price list available on request.

PARTRIDGE TRANSFORMERS LTD.

TOLWORTH · SURREY *Telephone: ELMbridge 6737*

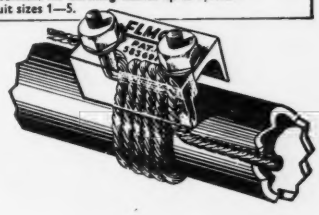
"ELMO"

EARTHING CLAMPS

A COMPLETE RANGE TO B.S.951. 1948 IN 4 SIZES

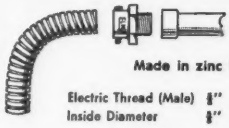
	A123	B45	C67	D8910
for earthing cables up to	7/0.036"	7/0.064"	19/0.064"	19/0.083"
to fit B.S. conduit sizes	1, 2 & 3	4 & 5	6 & 7	8, 9 & 10
I.e. in trade terms	½" to ¾"	1" and 1¼"	1½" and 2"	2½" to 3½"

NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029" and for B.S. conduit sizes 1—5.



"Elmo" Earthing Clamps are of robust construction. Impossible for wire to pull out, always under tension, therefore a most satisfactory earth and a permanent safeguard.

ELECTRICAL FITTINGS



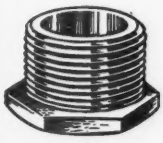
Flexible-to-rigid CONDUIT COUPLINGS

Made in zinc base alloy in the following sizes

Electric Thread (Male)	⅜"	½"	1"	1¼"	1½"	2"
Inside Diameter	⅜"	½"	1"	1¼"	1½"	2"
Electric Thread (Male)		⅜"	½"	1"	1¼"	
Inside Diameter Flexible Conduit		⅜"	½"	¾"	1"	

WITH EARTHING TERMINAL

Special Features: Integral Earthing Terminal, tinned ready for soldering. Fixing screw for continuity. Internal threads suit all makes of flexible tubing.



CONDUIT BUSHES

Made in the following sizes:

MALE: Electric Thread
⅜" ½" 1" 1¼" 1½" 2"

FEMALE: Electric Thread
⅜" ½" 1" 1¼" 1½" 2"

MALE
Hex. Section

FEMALE
Flat Face Section for Spanner (except ⅜" size, which is round)

CONDUIT HOOK

For fluorescent lamps and overhead lighting fittings. Screwed ⅜" thread, male electric.

Made to fit all standard boxes with two holes 7/32" diameter — 2" centres diametrically opposed. Designed in accordance with British Standard Specification.

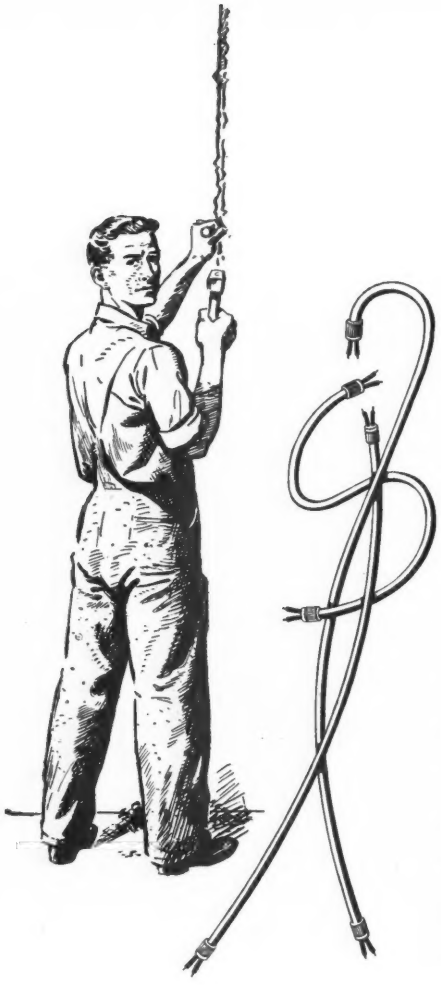
Both made in aluminium alloy

CEILING PLATE

One hook

Manufactured by M. MOLE & SON LTD.

BIRMINGHAM · 3 · ENGLAND Est. 1835



What are you up to?

When installing Pyrotenax M. I. Cables, undoing the good work of the "brickey" is quite unnecessary — chasing is virtually eliminated. 'Pyrotenax' can be buried in less than half * the depth of plaster or screed required by conduit. 'Pyrotenax' goes *on* and not in the brickwork, and you are assured of a permanent, safe job. Any extensions may be effected by running a shallow groove in the plaster.

** e.g. for 13 amp. Ring circuits a 'Pyrotenax' twin ·003 sq. in. "Light Duty" grade cable is required and is just over ¼ in. diameter. See full scale sketch.*

Write for full details and "Technical Data No. D.37."

Pyrotenax
COPPER COVERED MI CABLES
PERFECTED BY EXPERIENCE

The use of the trade name 'Pyrotenax' is exclusive to the products of this Company and its associates.

NON-FIRE CAUSING • HEAT RESISTING MOISTURE PROOF • NON-AGEING • RUST PROOF SAFE AGAINST OVERLOAD • RESISTANT TO MECHANICAL MALTREATMENT • RESISTANT TO NOISE TRANSMISSION

PYROTENAX LIMITED
HEBBURN-ON-TYNE · Telephone: Hebburn 32244/7

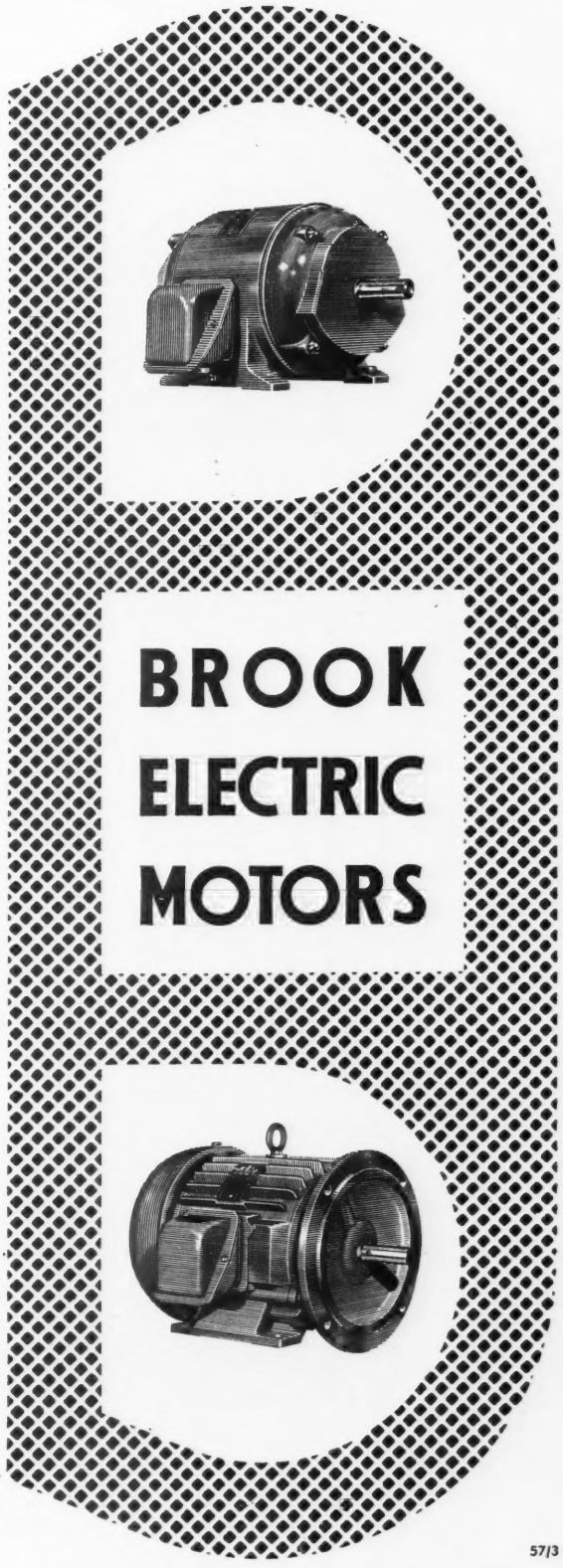
LONDON: *Abbey 1654/5* **BIRMINGHAM:** *Midland 1265.* **MANCHESTER:** *Blackfriars 6946.* **LEEDS:** *Leeds 27826.* **GLASGOW:** *City 3641/2.* **CARDIFF:** *Cardiff 23689*
GD37

ELECTRIC MOTORS?

BROOK WILL HAVE THE ANSWER

When new plant is being installed or a new machine is in the design stage, you can save valuable time by consulting the electric motor maker.

There are literally thousands of variations in horse power/speed types, in enclosures, in starting features. Brook Technical Sales Staff can suggest the best combination of these characteristics for your particular purpose. This service costs nothing . . . that is why most people think of BROOK always for electric motors.



"We always specify"

BROOK MOTORS Ltd

1/25-600 h.p.

HUDDERSFIELD

57/3

This is a **SIGN!** for an Electric motor...

this is the **SIGN** for the BEST Electric motor...

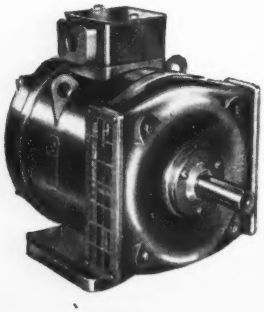
EST S E M 1914

PRECISION BUILT ELECTRIC MOTORS

Designed with 40 years experience in scientific research and development.

A.C. single and three-phase motors up to 10 H.P.
Fractional H.P. D.C. motors.
Electric truck motors up to 10 H.P. and control gear.
A.C. single-phase self-regulating alternators.
Loom motors—switchgear—transformers—electronic control gear, etc.

Contractors to all Government Departments



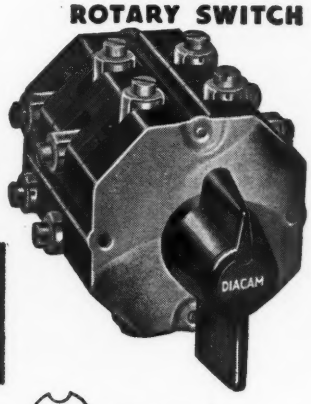
Small Electric Motors Ltd.

BECKENHAM, KENT
Tel: Beckenham 0066 & 1152

EAGLE WORKS, BECKENHAM
ST. JOHN'S WORKS, PENGE
LAUREL GROVE WORKS, PENGE

THE VERSATILE DIACAM ROTARY SWITCH

This 30-amp. rotary switch has solid silver contacts and a double-break on each pole, ensuring maximum efficiency and absolute safety under all conditions. Available in most sequences for either single or multi-pole switching.



This shows the patent terminal clamp securing two conductors

The specially engraved identity discs, also panel mounting indicator plates, can be supplied to customers' requirements

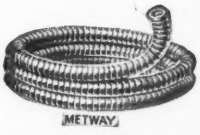
CRAIG & DERRICOTT LTD.

ROYAL WORKS, SUTTON COLDFIELD. Tel.: Sutton Coldfield 2547

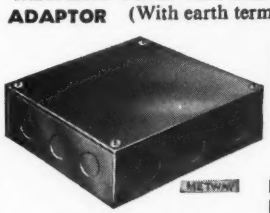
METWAY PRODUCTS

PRESSED STEEL UNIVERSAL BOXES

HEAVY GAUGE STEEL
1-4 way and back outlet. Also loop in boxes



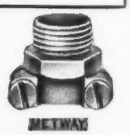
METALLIC TUBES and DIECAST ADAPTOR (With earth terminal)



ADAPTABLE BOXES
66 standard sizes

For these and hundreds of other wiring accessories, ask for list No. OHN 32/ER

BONDING NIPPLES

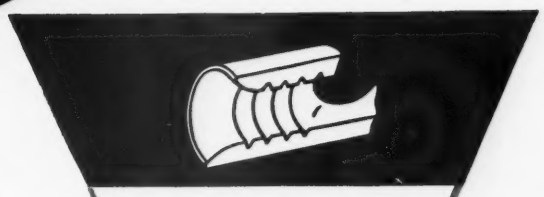


METWAY · BRIGHTON · ENGLAND

SOLISTRAND* TRADE MARK

one of our most adaptable solderless terminators

FOR SOLID WIRE, STRANDED WIRE IRREGULAR SHAPED CONDUCTORS COMBINATIONS OF SOLID & STRANDED WIRE



A-MP* SYSTEMS AID EXPORTS

The **A-MP** solderless method meets wire termination specifications in foreign countries. Use of the **A-MP** method will enable you to compete in world markets It is particularly significant that **A-MP** systems are standard practice in the U.S.A.

A-MP SOLISTRAND terminals provide the ***only*** effective crimp type solderless connection for ***solid*** wire. Utilising the "W" crimp, two indents aligned longitudinally with the terminal barrel, full surface area contact with the conductor is assured. The folding action of the crimp completely closes the air space within the barrel and definitely locates the conductor in a central position. This unique crimp can also be used effectively with stranded wire, combinations of solid and stranded wire, or irregular shaped conductors.

SEE US NOW ABOUT THE CREATIVE APPROACH TO BETTER WIRING

A-MP* TRADE MARK

AIRCRAFT-MARINE PRODUCTS (GT. BRITAIN) LTD.

London Office: DEPT. 7, 60 KINGLY STREET, LONDON, W.1. Telephone: REG 2517-8 and 3681-2-3
Works: SCOTTISH INDUSTRIAL ESTATES, PORT GLASGOW, SCOTLAND

* Trade Mark of AMP Incorporated, U.S.A.

AP 323/50

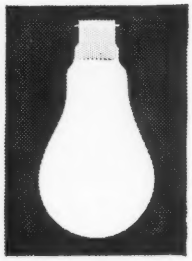
B

Light used to be an expensive commodity—much too precious to waste out of doors. The old lady at the bus stop can remember when every excursion after dark used to be an adventure. But over the past half century, science has been giving us more and more light for less and less money, until now we can afford to be generous with it. Much of this revolution in lighting was the work of Edison and Swan who invented the filament lamp. The subsequent development work that has gone on in the Siemens and Ediswan works explains why you get more light for your money when you ask for Siemens Ediswan lamps today.

these eyes have seen a revolution

SIEMENS EDISON SWAN

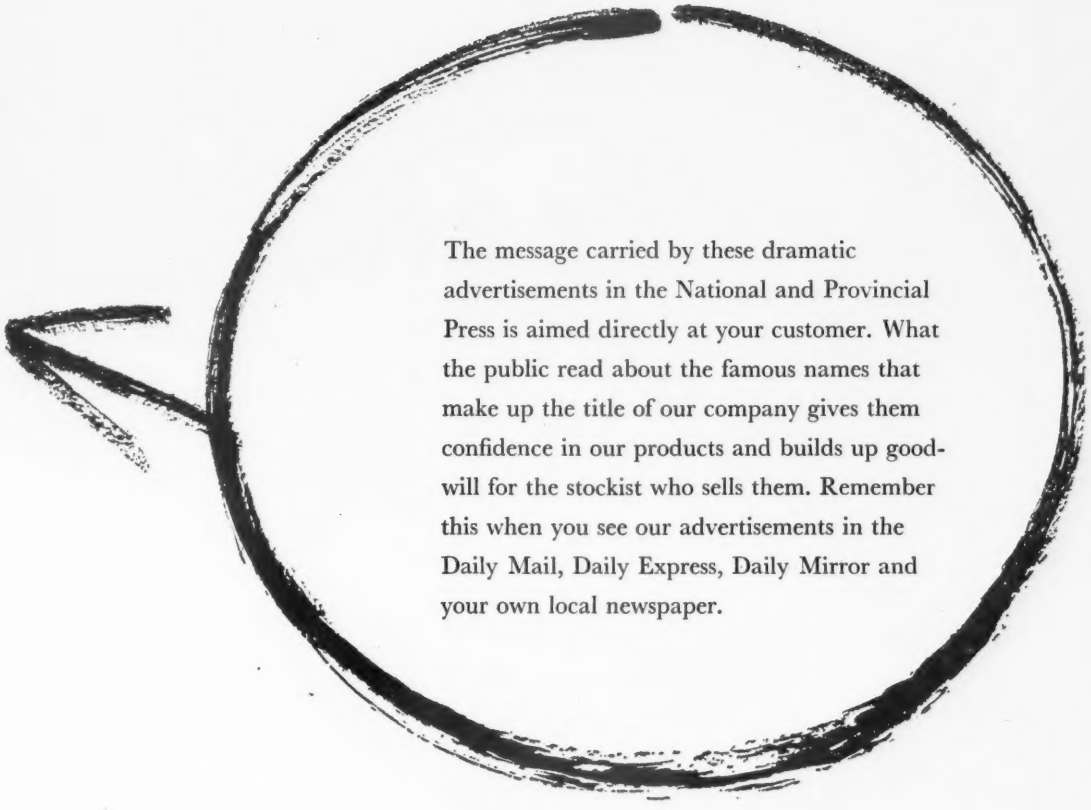
Siemens Edison Swan Ltd · An A.E.I. Company



say SIEMENS EDISWAN *for a brighter light*

LAMPS · TELEVISION TUBES · RADIO VALVES

Keeping an eye on your business



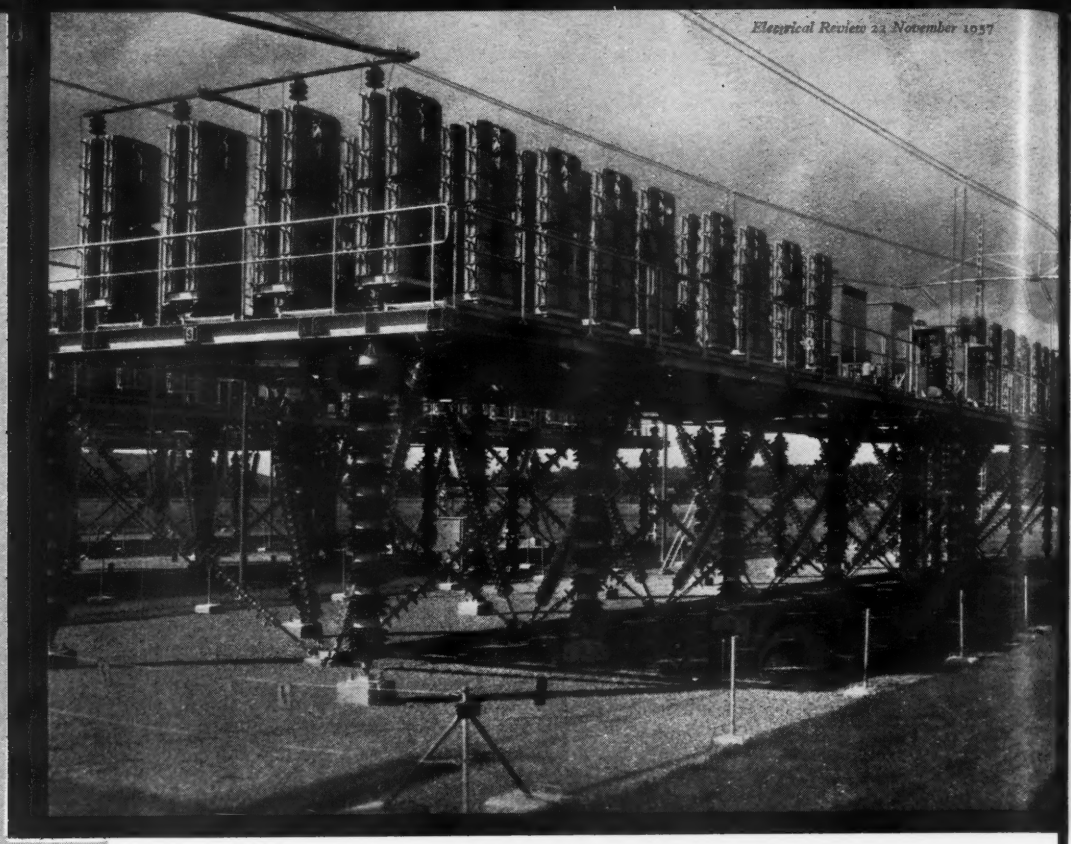
The message carried by these dramatic advertisements in the National and Provincial Press is aimed directly at your customer. What the public read about the famous names that make up the title of our company gives them confidence in our products and builds up good-will for the stockist who sells them. Remember this when you see our advertisements in the Daily Mail, Daily Express, Daily Mirror and your own local newspaper.

SIEMENS EDISON SWAN LTD · AN A.E.I. COMPANY

155 Charing Cross Road, W.C.2, 38/39 Upper Thames Street, E.C.4, and at Woolwich

DISTRICT OFFICES AND BRANCHES THROUGHOUT THE COUNTRY

CRC 11/9



CAPACITORS

FOR HIGH AND LOW TENSION

Rated at 105 MVAr, the ASEA series capacitor installation shown above is not only one of the largest series capacitors in the World, but also the first for what is still the highest service voltage in the World—380 kV.

ASEA Capacitors are available also for all fields of power factor correction at high and low tension supplies.

The value of capacitors is now universally recognised. We claim that ASEA capacitors, which are among the best available, coupled with our long and wide experience over many years, will provide the most efficient and reliable plant to deal with your power factor problems.

A range of literature is available on power factor correction and we shall be glad to send copies to you on application.

ASEA

Sole Representatives in the United Kingdom

FULLER ELECTRIC LIMITED

FULBOURNE ROAD • LONDON • E.17

Phone: LARkswood 2350 (10 lines)

A NEW DESIGN

providing greater safety to operating personnel is described in this publication

Have you received your copy?

If not, write for Publication FG/133 to:
The ENGLISH ELECTRIC Company Limited,
Fusegear Division,
East Lancashire Road, Liverpool 10.

Stocks of 30, 60 and 100 amp. sizes are now available.

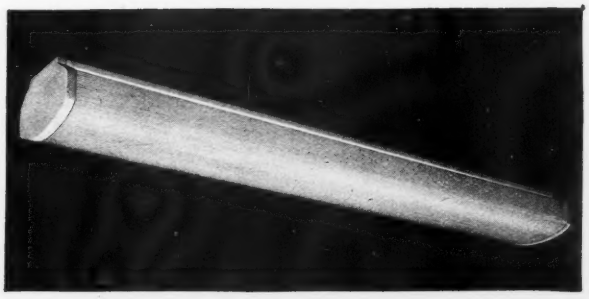
'ENGLISH ELECTRIC'
fusegear

THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2

FG. 28A F7 WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

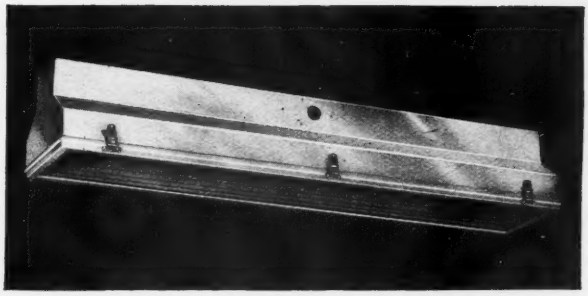
First Choice

Model EP.802
TWIN 80 WATT
Suspended or Ceiling Fitting with Opal Fluted "Perspex" Diffusing Cover



Britain's best range of Fluorescent Fittings selected for efficient lighting by famous concerns all over the world.

Model VP.802
TWIN 80 WATT
Industrial Vapour-proof Totally Enclosed Fitting suitable for internal or external application

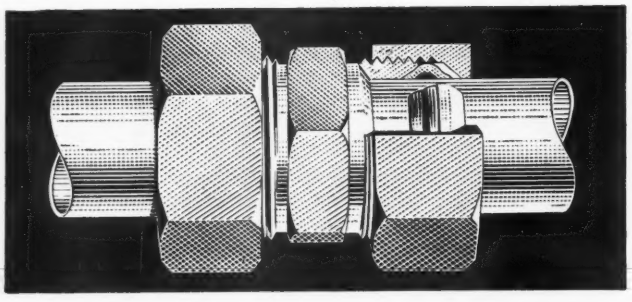


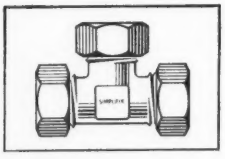
UTILAIR

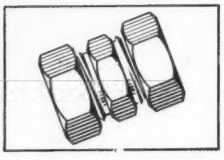
Fluorescent Lighting Fittings and Accessories

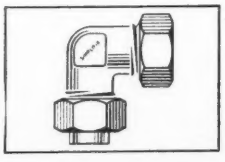
UTILITIES (LONDON) LTD.
435-437 BRIXTON ROAD, LONDON, S.W.9
Phone: Brixton 6811/2/3

SIMPLIFIX compression joints









for a perfect compression joint in minutes ...

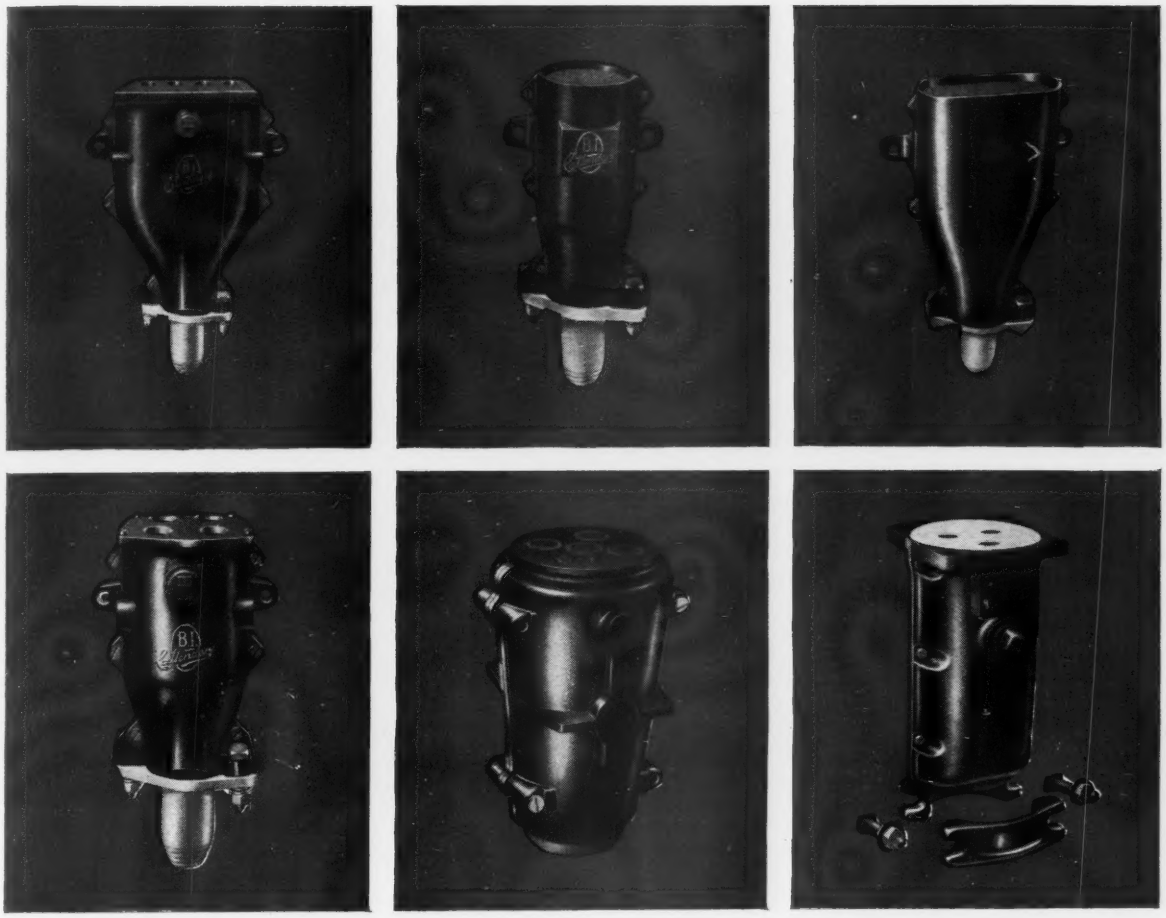
Simplifix takes all the bother out of pipe line assembly. Makes safe, leak-proof joints in a matter of seconds. No work to be done on the pipe ends beyond removing the burrs. No distortion to the piping because a special anti-friction washer prevents the pipe from twisting whilst the nut is being tightened.

● *Note: Simplifix fittings can be used on very thin walled tubing.*

A full range of fittings, elbows, tees, crosses etc., is available and illustrated in our catalogue which will be sent on request.

SIMPLIFIX COUPLINGS LIMITED
HARGRAVE ROAD · MAIDENHEAD · BERKS. TEL: MAIDENHEAD 2271/4

SIMPLIFIX



Terminating Paper-Insulated Cables for medium voltage working

There is a wide range of BICC Indoor Terminal Boxes for use with paper-insulated cables of up to and including 1,100 volts. They are made from cast iron, in flat, flanged and circular shapes. For installations where maximum economy is essential there are also models moulded in insulating material.

A full range of compounds and tapes is available for use with all types of boxes.

We will be glad to give you further details about Indoor Terminal Boxes, Joint Box Compounds and Insulating and Protective Tapes on request.

BICC **INDOOR TERMINAL BOXES**

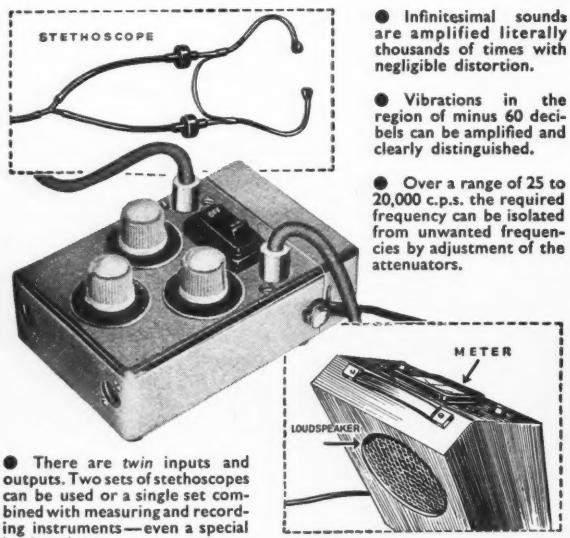
BRITISH INSULATED CALLENDER'S CABLES LIMITED, 21 Bloomsbury Street, London, W.C.1

The Superlative SONISCOPE Regd.

ELECTRONIC STETHOSCOPE

The performance of this instrument is so remarkable it must be heard to be believed

Here is the SONISCOPE, an outstanding achievement in *three* techniques — miniaturisation, electronics and acoustics. In sensitivity and selectivity, range and amplification, its performance goes far beyond any previously known standards and would be remarkable even in an instrument of normal size. By registering the sounds, vibrations and rhythms of machinery, electrical plant and pipelines, the SONISCOPE has no equal in discovering the most minute imperfections.



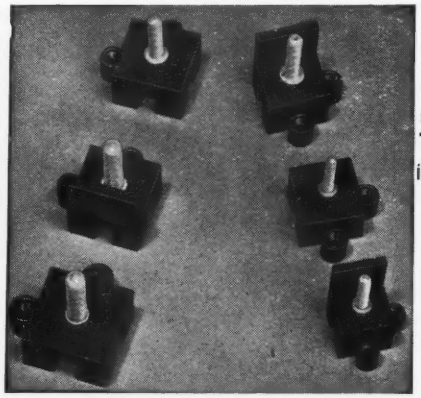
- Infinitesimal sounds are amplified literally thousands of times with negligible distortion.
- Vibrations in the region of minus 60 decibels can be amplified and clearly distinguished.
- Over a range of 25 to 20,000 c.p.s. the required frequency can be isolated from unwanted frequencies by adjustment of the attenuators.
- There are *twin* inputs and outputs. Two sets of stethoscopes can be used or a single set combined with measuring and recording instruments—even a special loudspeaker.
- Size 4¾" × 3¼" × 1⅜". Battery operation.

Please ask for further particulars

AIRSONIC LTD.
Dept. E/3, 14 OLD QUEEN STREET, LONDON, S.W.1
Telephone: TRA*falgar* 2255/6/7

PB5

No longer ***NEW*** *but accepted.*



Unit construction TER-MATE inter-locking terminal blocks

Patented

Repeating orders and C S A Approval confirm the adaptability of these terminals which are now available in stud sizes ranging from 4. B. A. to 5/16" moulded in bases 5/8" square to 1 1/4" with or without barriers.

Any shape, any number of ways, anywhere, all as an integral unit, ideal for panels etc.

Samples and literature on request:—

TERMINATION EQUIPMENT CO. LTD.
NOEL WORKS, ELSON STREET, BASFORD, NOTTINGHAM
Tel.: Nottm. 76638/9

PHIL-TROL SOLENOIDS

QUICK DELIVERY
Solenoids are normally despatched same day as receipt of order.

Range covers types 41 and 42 (front 1" × 1½") 38, 39 and 40 (front 1½" × 1⅝") and power A.C. and D.C. sizes up to 60 inch-lbs.

6 v-460 v A.C. and D.C. types

PHILLIPS CONTROL (G.B.), LTD.
Farnborough, HANTS. *Telephone: Farnborough 1120*

PRESSPAHN, LIMITED
Manufacturers of
ELECTRICAL WELLSTEAD INSULATION

ELECTRICAL INSULATING MATERIALS
PRESSPAHN, LTD - BRADFORD - YORKS
Phone: Bradford 25135 PBX. Grams & Cables: "Presspahn, Bradford"

NOW! an even better Double 'D' Redhead easier installation –

FOR 6 GOOD REASONS

1 SMALLER TERMINAL COVER
Half previous height — means easier installation in limited space

2 FULLY ADAPTABLE
With heaters of 18" length and over an 11" or 18" Rod type thermostat may be fitted as desired

3 TOP-FIXING TERMINAL SCREWS
Easier wiring connections where heater is mounted side entry in lagged tank

4 TERMINAL COVER
carrying cable entry bush can be rotated through 360°

5 THREE ILLUSTRATED DISCS
in head of each heater show methods of inserting and wiring different types of thermostat

6 RE-POSITIONED ELEMENT TUBES AND THERMOSTAT POCKET
give wider clearance, less chance of scale build-up in hard water areas

No stocking problem with the new Double 'D' Redhead! It will take either adjustable Rod type or Sunvic TQB pre-set thermostats. Available in lengths of 11½, 14, 18, 23, 27, 30 and 36 inches, each at £2.10.0

For your own convenience — and your customers' — stock only

the *NEW* Double 'D' Redhead by Creda

Simplex Electric Co Ltd
Creda Works Blythe Bridge Staffs
London Showrooms: Creda House Binney Street London W1

CREDA make the most popular electric cookers too

A COMPANY

When Mr. Stone gets excited

HE SHOUTS

If his excitement is caused by dissatisfaction with a purchase, he may shout your name but spiced with adjectives, giving other customers a bad impression of your product. 'Just what Mr. Stone intends', you may say. 'It's grossly unfair. What failed was not my part of the product, but a component supplied by someone else.' But remember! Mr. Stone, who is not an electrical expert, trusted your reputation and now feels let down. The only way an electrical heating appliance manufacturer can guard against this is to incorporate materials of known dependability. Brightray nickel-chromium alloys have long proved their quality and dependability for electrical heating elements.

BRIGHTRAY

ELECTRICAL RESISTANCE ALLOYS

Produced in the form of Rod, Wire, Strip and Tape

BRIGHTRAY C for intermittent heating up to 1150°C ... used in cookers, toasters, laundry irons, fires, soldering irons ...

BRIGHTRAY B produced to provide a cheaper but satisfactory material for elements working up to 950°C ...

BRIGHTRAY S for continuous heating up to 1150°C ... principally intended for electric furnace heating elements ...

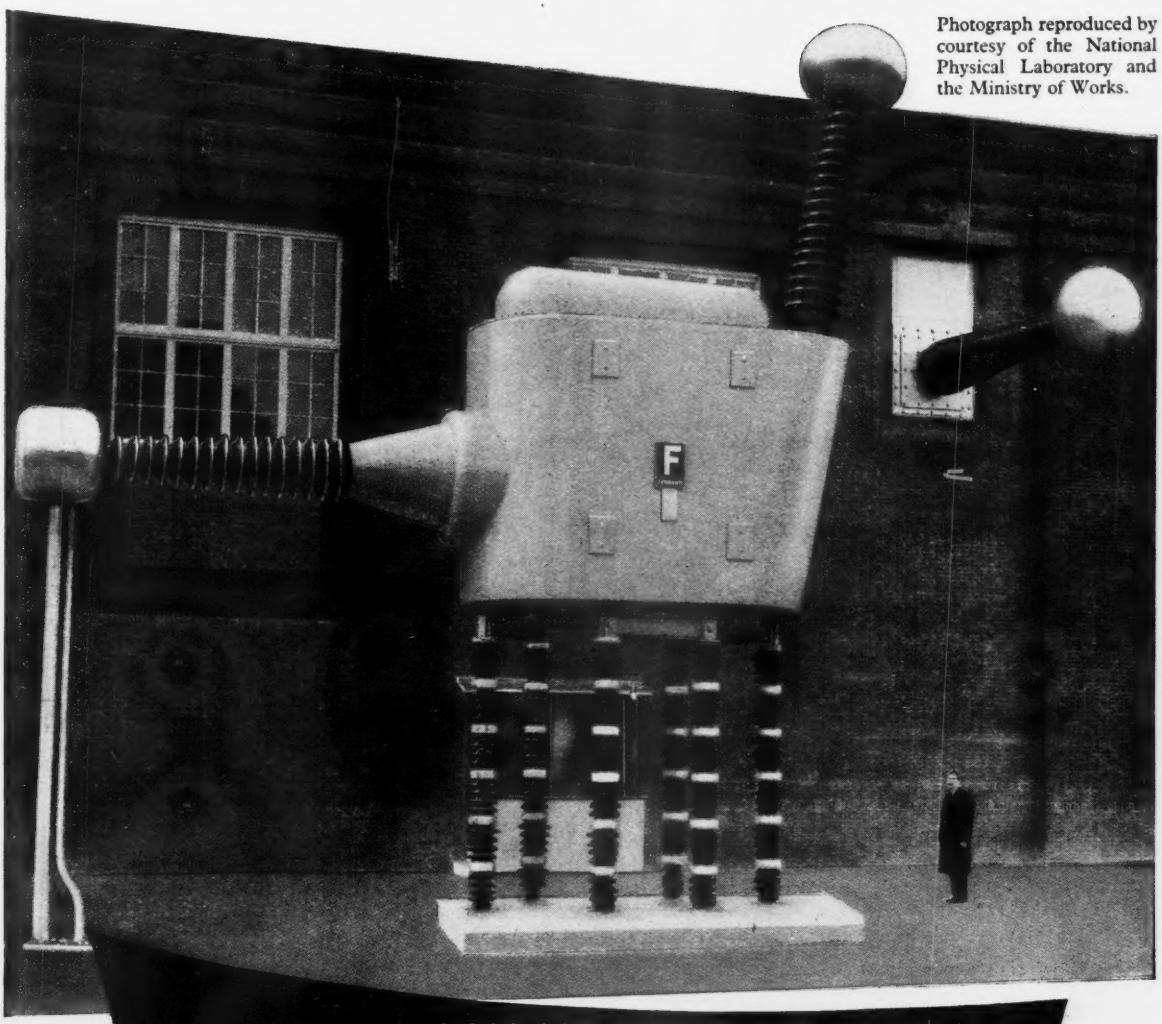
BRIGHTRAY F for electric furnace elements operating in special atmospheres up to 1000°C ...

WILCO-WIGGIN THERMOMETALS in many grades for thermostatic devices controlling temperatures ranging from −75 to 540°C.

'BRIGHTRAY' AND 'WILCO-WIGGIN' THERMOMETALS ARE REGISTERED TRADE MARKS

HENRY WIGGIN AND COMPANY LIMITED · WIGGIN STREET · BIRMINGHAM 16

TGA ER66



Photograph reproduced by courtesy of the National Physical Laboratory and the Ministry of Works.

1,000,000 VOLT FERRANTI TESTING TRANSFORMER *installed at the* NATIONAL PHYSICAL LABORATORY

THE HIGHEST VOLTAGE OUTDOOR TESTING TRANSFORMER IN THE UNITED KINGDOM

A 1,000,000 Volt Ferranti Testing Transformer operating with the tank at a potential of 500,000 Volts above earth. The transformer is mounted on 6 columns of insulators at a height of 12 feet from ground level. The overall height of the complete equipment is 36 feet. Associated with the equipment is a 1,000,000 Volt wall bushing, 36 feet in length, through which the supply is carried to the test laboratories.

Ferranti are specialists in the manufacture of High Voltage A.C., D.C. and Impulse Testing Equipments for all kinds of research and routine testing and are backed by over 70 years' experience in the manufacture and development of electrical apparatus.

This equipment was installed under the direction of the Ministry of Works.

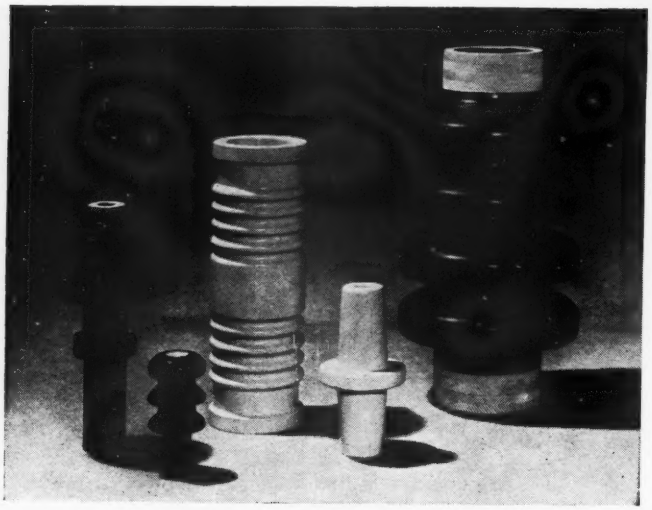
FERRANTI LTD • HOLLINWOOD • LANCS

London Office: KERN HOUSE • 36 KINGSWAY • W.C.2.

FT201/2

J. MACINTYRE & CO. LTD.

Manufacturers of
PORCELAIN INSULATORS



Insulators for
HIGH TENSION
LOW TENSION
REFRACTORIES
and Special Ceramics

Waterloo Road
Burslem
Telephone : Stoke-on-Trent 87938

ISMAY
ART
CANDLE LAMP

In 25W. and 40W. White Opal or colour sprayed champagne, red or green. Standard Caps. B.C. and S.B.C.

All enquiries to:
ISMAY LAMPS LIMITED
Roden Street Works, Ilford, Essex
Telephone: ILFORD 1153

STEEL **SHELVING**

72" HIGH
34" WIDE
12" DEEP

- *Brand new — Manufactured in our own works*
- *Shelves adjustable every inch*
- *Heavy gauge shelves will carry 400 lbs. each*
- *Stove enamelled bronze green*
- *6 shelves per bay— Extra shelves 8/- each*
- *Quantity discounts*

DELIVERED FREE
£3.15.0
Ready for Erection

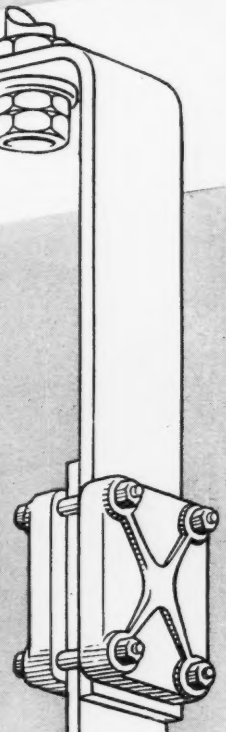
N. C. BROWN LTD.
Rochdale Road Works
HEYWOOD · LANCS
—the manufacturers!

This shelving is available in WHITE enamel at extra cost

ALL OTHER SIZES available at equally keen prices.

Telephone: Heywood 69018 (3 lines)

'KYNAL' ALUMINIUM ALLOY BUSBAR AND JOINTING COMPOUND



'Kynal' M.38 aluminium alloy busbar is strong (minimum U.T.S. 13 tons/in²), light and durable. Supplied in flat bar, tubular section or profiles to meet all needs, it has a minimum conductivity of 55% I.A.C.S.

To resolve the difficulties often associated with making efficient and lasting connections between aluminium/aluminium and aluminium/copper surfaces, I.C.I. has developed 'Kynal' Busbar Jointing Compound, which is giving every satisfaction in service. 'Kynal' M.38 aluminium alloy busbar, assembled with 'Kynal' Busbar Jointing Compound, provides the electrical industry with one of the most easily erected and efficient aluminium conductor systems.

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1

ICI METALS DIVISION

K.L.S

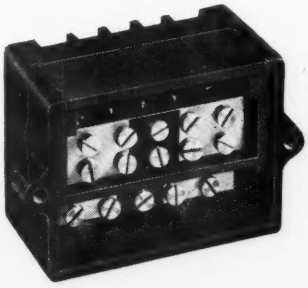
Equipment for Bradwell

All the switchgear comprising the main 132-kV air-blast circuit-breakers, 6·6-kV, 3·3-kV, and 415-volt air-break equipment for auxiliary supplies, together with its associated control apparatus for Bradwell Nuclear Power Station is being supplied by Reyrolle who are responsible also for the reactor control-rod heads, the fission-products detection equipment, and the machining of the graphite blocks.

Reyrolle specialists in switchgear and control-apparatus

MEMBER OF THE NUCLEAR POWER PLANT CO LTD NPPC

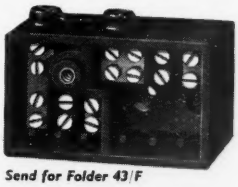
A. Reyrolle & Company Limited · Hebburn · County Durham · England



For 3 cables up to .0225 sq. in. and 2 up to .04 sq. in. Removable compartment for the neutral connector facilitates wiring.

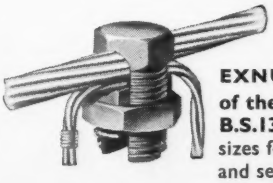
DOUBLE-POLE INSULATED CONNECTOR BOXES

Incoming, one cable up to .0225 sq. in.
Outgoing, one cable up to .0225 sq. in. and two up to .007 sq. in.
Fits directly below meter—no shield required.



Send for Folder 43/F

SERVICE TAPS



EXNUT
of the type illustrated in B.S.1320 : 1946. Range of 4 sizes for up to .20 sq. in. line and service wires.

NUT TYPE
Cheapest and most popular Service Taps. Range of 4 sizes for up to .10 sq. in. line and service wires.

SHROUDS
Available for both Exnut and Nut Type service taps.

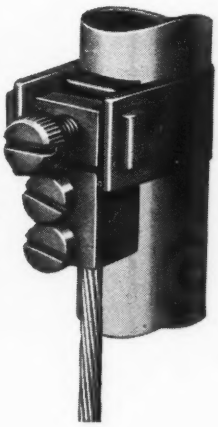
Send for Leaflet 47/E

HENLEY

ELECTRICAL
DISTRIBUTION EQUIPMENT

Watch this series of advertisements for many of the interesting items in our wide range of products. We shall be pleased to send you full information.

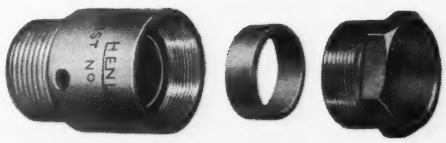
EARTHING CLAMPS



For use on metal pipes, etc.
Comprising only two parts and accommodating stranded conductor (as shown) or strip. Range of sizes up to No. 5 of B.S.951.

Send for Leaflet WSA/6

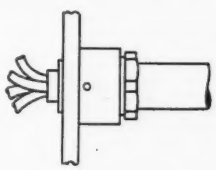
TERMINATING GLANDS



For P.V.C., Polythene or V.R., S.W.A. Cables. Range of 5 sizes for cables up to diameter over armour of 1.92 in. or over outer sheath or serving 2.15 in.

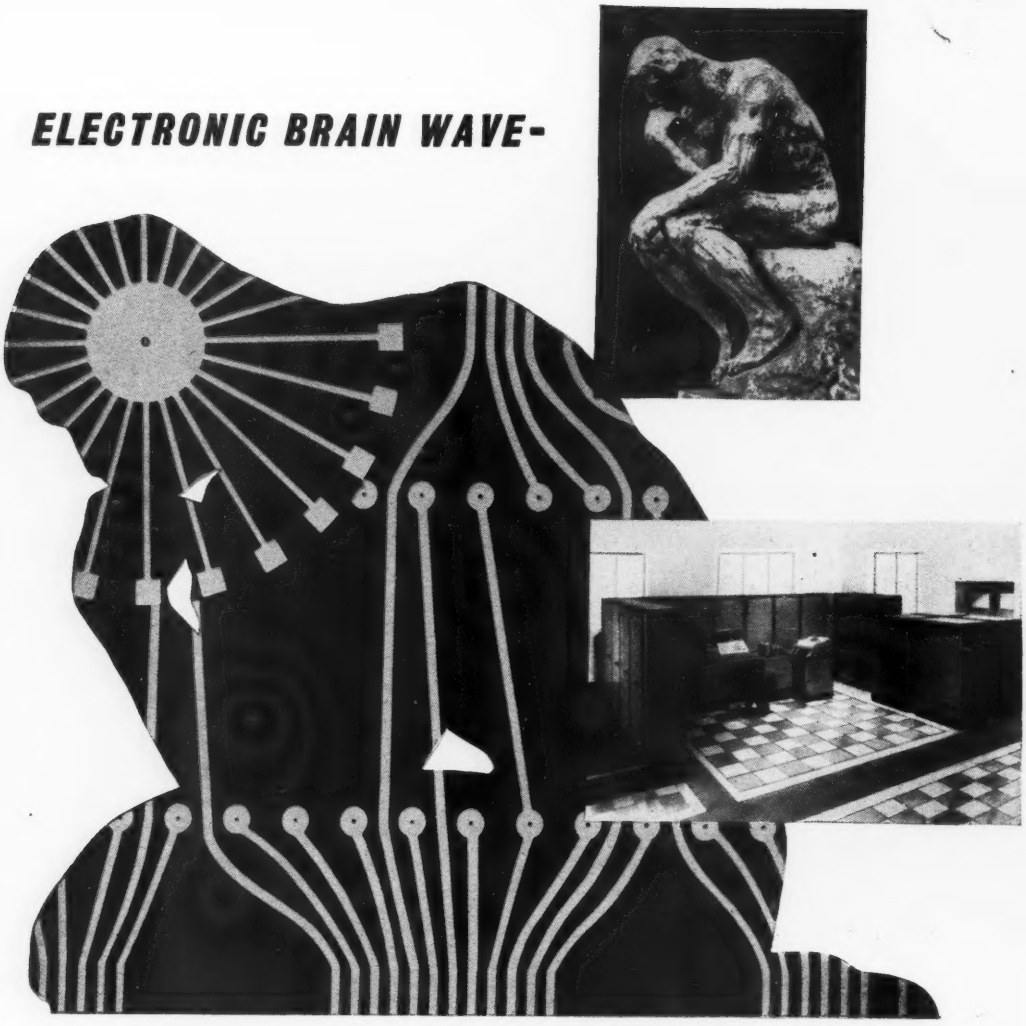
P.V.C. Shrouds available to cover the complete assembly.

Send for Folder 37/C



W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1 *Tel: CHAncery 6822*

ELECTRONIC BRAIN WAVE-



with BAKELITE Copper-Clad Laminated

REGD.

The Ferranti Mercury Computer, an immensely powerful machine of enormous capacity, is exceptionally fast and provides facilities for the most advanced techniques of programming. Among many interesting features of this machine is the use of printed circuits produced from BAKELITE Copper-Clad Laminated Materials. Used in front to back inter-connected panels and for mounting special pieces of equipment in various parts of the Computer, they reduce the bulk of these assemblies, thus helping to keep down the overall size of the Computer. Reliability provided by printed circuits is of prime importance and their use eliminates the possibility of faulty wiring, thus making servicing and maintenance very much simpler.

Today printed circuits on BAKELITE Copper-Clad Laminated Materials, either rigid or flexible, are finding new applications throughout the Radio and Electronics industries. They allow more freedom and precision to the designer, reduce production time and costs for the manufacturer, and give the customer a lighter, more compact and reliable instrument.

Write today for a copy of "Copper-Clad BAKELITE Laminated for Printed Circuits".

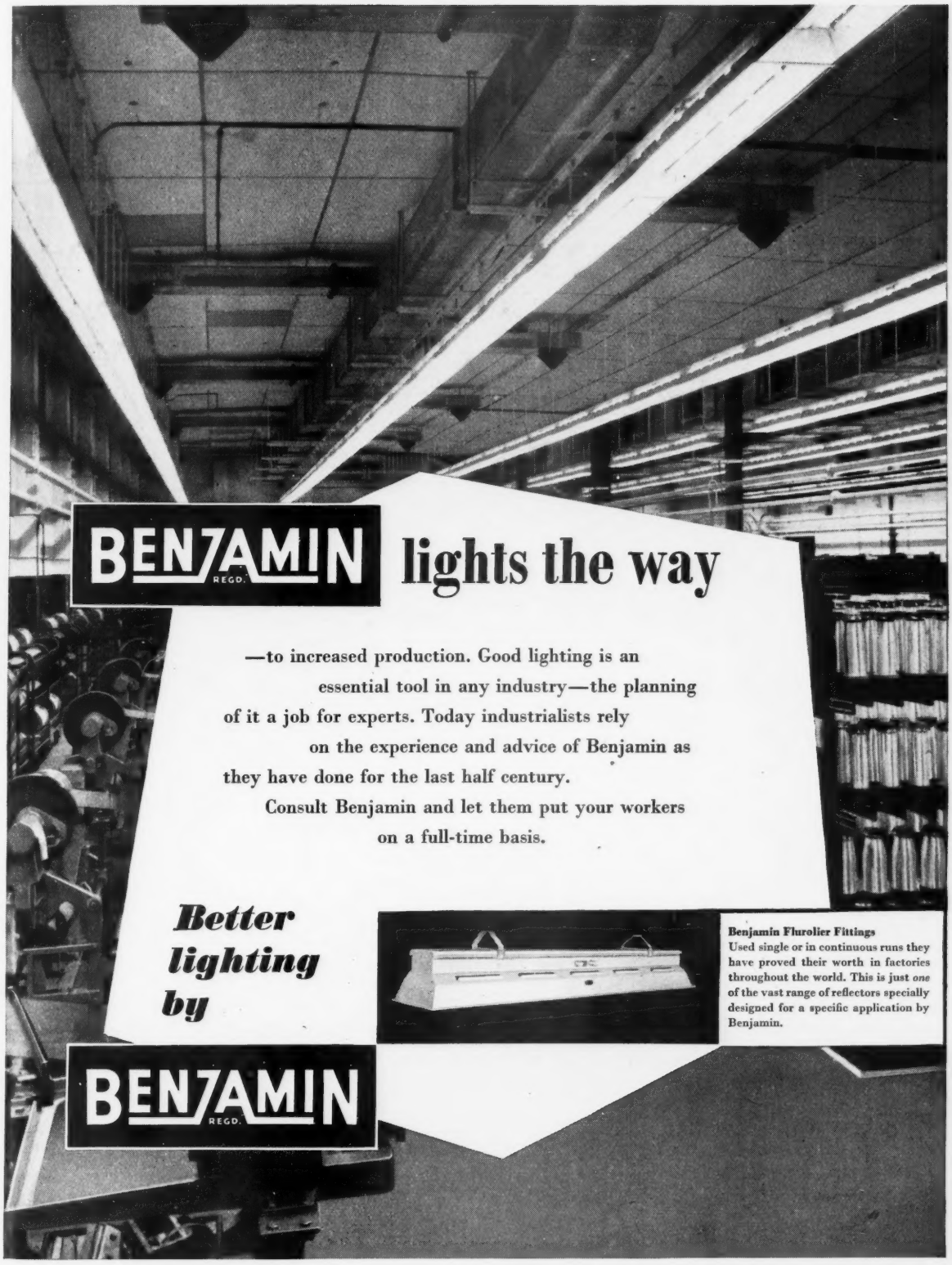
BAKELITE LIMITED

REGD

12-18 GROSVENOR GARDENS · LONDON SW1 · SLOane 0898

Bakelite Limited manufacture an extensive range of plastics materials and maintain a technical service unequalled in the industry. No matter what your plastics problems this service is at your disposal. SLOane 0898 is the telephone number.

TGA 1PBA


BENJAMIN REGD.
lights the way
—to increased production. Good lighting is an essential tool in any industry—the planning of it a job for experts. Today industrialists rely on the experience and advice of Benjamin as they have done for the last half century.
Consult Benjamin and let them put your workers on a full-time basis.
Better lighting by
BENJAMIN REGD.
Benjamin Flurolier Fittings
Used single or in continuous runs they have proved their worth in factories throughout the world. This is just one of the vast range of reflectors specially designed for a specific application by Benjamin.

Please write for full details to:

THE BENJAMIN ELECTRIC LIMITED · TOTTENHAM · LONDON N17

Telephone: TOTtenham 5252 (5 lines) Telegrams: "Benjalect, Southtot, London"

BIRMINGHAM: 5 Corporation Street, Birmingham 2. Tel. MIDland 5197 LEEDS: 49 Basinghall Street, Leeds 1. Tel. LEEDS 25579

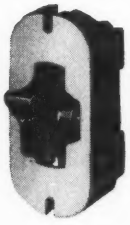
Smee's 103

Mk.144 DHB

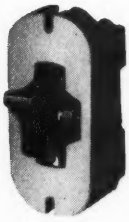
NEW MK GRIDSWITCH COMPONENTS

5 amp one-way secret key switch
List No. 4777

5 amp two-way secret key switch
List No. 4778

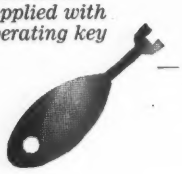


15 amp one-way single pole switch
List No. 4761

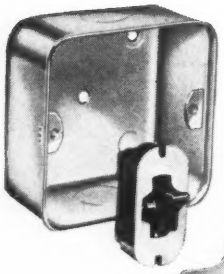


15 amp two-way single pole switch
List No. 4762

Secret key switches are supplied with operating key

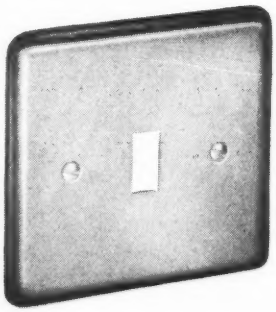


THE MOST VERSATILE SWITCH OF ALL!



These four new switches have identical fixing centres and are completely interchangeable with every other grid-mounting component in the range. Now you can make up switch units containing any combination of 5 amp or 15 amp one-way or two-way switches, 5 amp one-way or two-way secret key switches, 15 amp double pole switches, 5 amp bell-pushes, neon indicator units and blank insets.

You can order the units separately and build up the combinations to suit your own purposes.



HAVE YOU HAD THE MK 1958 CATALOGUE?

The complete Gridswitch range is described in the new 88 page illustrated catalogue. If you have not had your copy write for one today!

MK

. . . the mark of leadership

M. K. Electric Limited, Wakefield Street, London, N.18 · *Edmonton 5151*

22 NOVEMBER 1957

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

In This Issue

Towards Safer Installations 919
Reflections on the first year's work and future development of the National Inspection Council

Materials for Nuclear Reactors 921
Dr. A. B. McIntosh, of the U.K.A.E.A. Industrial Group, reviews the special requirements of reactor components and shows that advances in the technology of new and existing materials have frequently opened up applications beyond the scope of atomic energy

Telephone Automation 925
A new method of charging to be introduced on 1st January next will pave the way for full automation in the telephone service, including trunk dialling by subscribers

Ilgner Flywheel Equalising Sets 926
From an examination of alternative methods, the authors conclude that until Electricity Boards are willing to accept the resultant peak loads, industry must continue to use the Ilgner-Ward-Leonard control system for large reversing-mill motors

Underground Gasification 942
Plan for the construction of a pilot-scale gasification plant serving a 3·75 MW generating station

Distribution Systems 947
Experience with protective multiple earthing in the North Western Electricity Board's Area

✧ ✧ ✧ ✧

Printed Microwave Circuits	930	**New Electrical Equipment**	952
Views on the News	931	**Generation and Development**	954
Personal and Social	932	**Financial Section**	956
Diesel-Electric Locomotive	936	**New Patents**	960
Letters to the Editor	937	**Next Week's Events**	961
Industrial News	938	**Contract Information**	962
Building Exhibition	945		
Parliamentary Report	949	*CLASSIFIED ADVERTISEMENTS*	93
D.C. Winder Drives	951	*INDEX TO ADVERTISERS*	104

VOLUME 161 NUMBER 21 ✧ *Eighty-Sixth Year of Publication* ✧ FRIDAY PRICE 1s 6d

Editorial, Advertising and Publishing Offices: Dorset House, Stamford Street, London, S.E.1. Telegraphic Address: "Elecrev, Sedist, London." Code: ABC. Telephone No. Waterloo 3333 (60 lines). Registered at the General Post Office as a Newspaper. Entered as Second Class Matter at the New York, U.S.A., Post Office. Annual Subscription: Home £4 15s 0d; Overseas £5 15s 0d: U.S.A. and Canada $16.00. Cheques and Postal Orders (on Chief Office, London) payable to ELECTRICAL REVIEW PUBLICATIONS LTD. and crossed "Lloyds Bank."

The chill wind—that brings you Magicoal customers

There is no 'off' season for Magicoal fires; their ability to cheer up a dull day makes them welcome all the year round. But it's the chill wind of autumn that really sends up the sales.

That is why 11" triple column advertisements for Berry's Magicoal fires are appearing every week in the DAILY MAIL or DAILY EXPRESS from October to December, planting the idea of Magicoal when it has the best chance of taking root.

Backing these large spaces in the national press there will be colour pages in the home journals, while WOMAN and many other leading women's magazines will feature individual Berry fires.

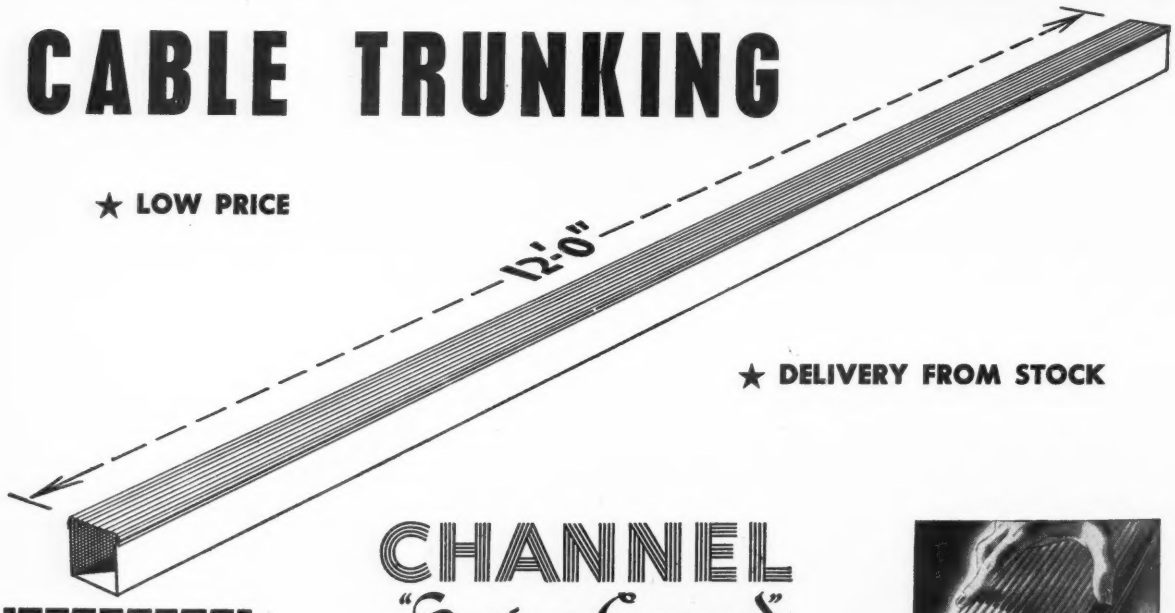
Cold weather and hard selling advertisements will bring customers to your door. Be ready for them with a good selection of Berry's Magicoal fires.

Berry's ELECTRIC MAGICOAL LTD

Touchbutton House, Newman St., London W.1
Telephone : MUSeum 6800

CABLE TRUNKING

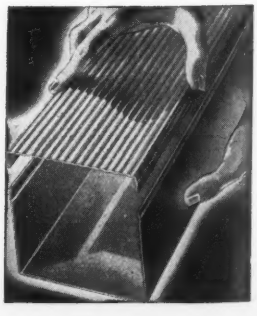
★ LOW PRICE



★ DELIVERY FROM STOCK

WRITE FOR BROCHURE No. R.A.116

CHANNEL "Spring Capped" CONDUIT



CHANNEL CONDUITS LTD., 11 VICTORIA STREET, LONDON, S.W.1. Telephone: ABBEY 2027/8

ELECTRICAL REVIEW

22 November 1957 Vol. 161 No. 21 Established 1872

Towards Safer Installations

IT is evident from the first annual report of the National Inspection Council for Electrical Installation Contracting, and the more recent account of its activities up to the end of September, that good progress is being made in the work of protecting the consumer against faulty or dangerous installations. In particular it is encouraging to learn how the many bodies with varying, and often conflicting, interests that are represented on the Council have worked together for the common good. Again, the strength of the inspecting force (there are 14 inspecting engineers who are together carrying out an average of nearly 100 inspections a week) and the strong financial position assured by the backing of the Electricity Boards, have enabled the Council to overcome the two principal weaknesses that stultified the work of the old National Register.

Since the first list of 3,500 approved contractors was published in June, there has been a steady flow of new applications. The 2,300 routine inspections that have been made this year have shown that the great majority of contractors make only minor departures from good practice and in only 2 per cent of the cases was the work considered to be of a really low standard. That there is room for improvement, however, is shown by the fact that no more than 5 per cent of the contractors inspected were found to be satisfactory in every way.

In addition to encouraging the maximum number of contractors to enrol, and ensuring that the required standards of work are subsequently maintained, the Council has the task of making its activities and aims widely known among those who employ contractors. To this end membership of the Council, which meets once a year, is open to all those organisations who are interested in the Council's work, either technically or as consumers, and Government Departments have also been invited to send observers. The National Inspection Board, which is the executive body, is, however, restricted to 16 members and with one exception these all come from various sections of the electrical industry. If this organisation is not to be regarded as a trade association, but as truly impartial, it would seem desirable to find room eventually for further representatives on the Board from outside the industry.

The Council has already achieved much in a short time with a limited budget for publicity. The 15,000 copies of the first edition of the Roll of Approved Contractors have been exhausted and it is reported that several large organisations have decided that all their installation and maintenance work shall in future be done only by contractors approved by the N.I.C. It is probable that these contractors already carry out some-

thing like 85 per cent of all contracting work done in this country. But since the total annual cost of such work can be reckoned in millions of pounds, the remaining 15 per cent is an appreciable amount. Further, since it consists mainly of the smaller installations, progress here is likely to be slower and, in terms of publicity, more costly.

The Council is therefore trying to interest potential customers, and also those local housing authorities which allot contracts to the lowest tenderer irrespective of the standard of work, through participation in appropriate local and national exhibitions and by the widest use by approved contractors of the N.I.C. emblem. In this connection it is to be hoped that the opportunity will not be lost for explaining not only the desirability of a safe installation but also the advantages of one well provided with power and lighting points.

UNDERGROUND GASIFICATION

There is every indication that Britain's energy requirements will grow so rapidly in the future that, even with nuclear power, they will be satisfied only by larger imports of oil. However, we do have in this country considerable reserves of poor quality coal, much of it at shallow depth, which has not been mined in the past largely because of its high ash content. The object of the Newman Spinney experiments described in this issue is to determine how effectively these reserves can be exploited by underground gasification to augment the nation's fuel supplies.

Although underground gasification may be able to produce electricity cheaply there are still many chemical and engineering problems to be solved. More must be learnt about drilling the long boreholes needed for exhausting the gas, and how to deal with fluctuations in the supply and quality of gas. Experience in gasifying different types of coal will also be necessary. It is not easy at this stage to estimate whether reductions in cost compared with conventional and nuclear generation can be achieved, and this is why the work supplementary to the pilot plant is of such importance. It is obvious, however, that the expensive instruments necessary at the experimental stage can be dispensed with, and the process cheapened by the time the commercial stage is reached.

UNIONS AND AUTOMATION

It is commonly thought that industrial workers are against the introduction of machines and methods which cut down labour. Although the Luddite movement is more than a century behind us traces of the fears that inspired it still remain. But generally the workers are now better educated and more enlightened and they realise that improved production methods ultimately raise their own standard of living.

Indeed, their representatives, far from being perturbed by the thought of automation, actually welcome it. Already the Trades Union Congress has expressed its views on the subject and at a conference last week Mr. J. W. Carron (of the Amalgamated Engineering Union), a member of the Council, indicated that the unions were not so much concerned with the possible immediate effects of automation upon their members as with the slow rate of introduction of automatic systems, which was placing us at a disadvantage in the face of growing competition overseas. That is not to say that the unions will not insist on certain safeguards, but it shows that a realistic attitude is being adopted.

AUTOMATIC TELEPHONE SERVICE

The reorganisation of the British telephone system proposed in the Government White Paper summarised in this issue constitutes the most sweeping and radical reform since the Post Office took over the telephone service from the National Telephone Co. in 1912. These fundamental changes are necessary to achieve full automatic service and only with such full automation will the best service be provided at the lowest cost.

The greatest problems of automation are not in the technical field; the human problems are much greater. Men and women are displaced because less staff is required, and career prospects are jeopardised. These things could cause much anxiety and hardship. The Post Office intends that full telephone automation shall be undertaken with the goodwill of the staff. Full regard will be paid to the interests of those who have given long service, and to such added responsibilities as may be carried by staff in the future. There will be many such problems to be solved. The Post Office and the trade unions will tackle these problems together. Post Office trade unions have declared their willingness to co-operate in the introduction of automation and they are already serving on working parties set up to consider its introduction and problems.

PROTECTIVE MULTIPLE EARTHING

Although an electricity supply undertaking has no legal responsibility for the effective earthing of consumers' equipment (apart from the duty of withholding supply in specified instances), it has become apparent that to secure safety the earthing arrangements of the two parties should be co-ordinated. The practice of the North Western Electricity Board of partly relieving new consumers of their share of the responsibility by providing an earthing block at the service entry is a move in the right direction. It does not wholly solve the problem, however, as Mr. P. Mather shows in his I.E.E. paper (summarised in this issue, page 945) in which he analyses the drawbacks under modern conditions of various methods of earthing the neutral of distribution systems.

Credit must also be given to the Ministry of Power and other authorities for their readiness to relax regulations as experience has shown this step to be justifiable, thus making protective multiple earthing a reasonably economical method of promoting safety.

IMMERSION HEATERS

Particulars of the various types and sizes of domestic immersion heaters now available will be given in next week's issue (29th November), a number of the models being illustrated. The tabulated details will include length, loading, size of head, price and purchase tax. In our issue of 20th December we shall be dealing with washing machines

MATERIALS FOR NUCLEAR REACTORS

Review of the Supply Problems Involved

By ALEX. B. McINTOSH
Ph.D., F.R.I.C., A.R.C.S.T., F.I.M.*

Fig. 1.—Process worker displaying Calder Hall type fuel element

WITH no previous experience to draw on, the rapid growth of atomic energy during the past decade has made necessary the development of materials combining physical, chemical and mechanical properties, together with suitable nuclear properties, a hitherto unencountered factor. The properties required are frequently found in metals and other materials available only in small research quantities and thus acute problems of supply can easily arise. Where customary engineering materials are acceptable standards of performance and of chemical purity not normally required in commercial practice are necessary and the resulting large development programmes have led to improved quality.

When fission takes place and the fuel atom breaks up into smaller fragments, two or three neutrons of high energy, known as fast neutrons, are produced at the same time. These neutrons can be slowed down until their energy is comparable to the thermal energy of ordinary atoms in a solid, by elastic collision with the atoms of a light element, or moderator, of low absorbing power for neutrons. For continuous heat production a chain reaction is necessary, and with natural uranium this is feasible only when the velocity of the neutrons has been slowed down in this manner, because only then does the susceptibility of the U235 nucleus to fission become competitive with other nuclear processes. Fast fission reactors which depend on high velocity neutrons to produce fission dispense with the moderator and employ a fuel artificially enriched in fissionable content.

The parameter "neutron capture cross-section" represents the capacity of the material to absorb neutrons and hence prevent their being available for further fission and so for the maintenance of a chain reaction.

In a thermal reactor the neutron capture cross-section of all materials in the fission zone must be maintained at a low level if natural uranium is to be used as a fuel, but in a fast fission reactor where the absorption of fast neutrons may be of an entirely different order this must be balanced against the need for a material to contain uranium at a high temperature.

For use in thermal reactors metals can be therefore listed in order of ascending neutron capture cross-section. The selection of materials for the fission zone is not simple because the nuclear properties of the coolant and other core materials also have an influence. The use of materials of higher cross-section must be paid for in neutrons, and so to compensate for this the fuel may require to be enriched in fissionable content, but the use of fuels enriched artificially in the U235 isotope involves a difficult process which on present techniques requires the availability of cheap and plentiful electrical power to reach an economic price. To date, the choice of any material for use in or near the core of a reactor has been restricted to those possessing such low cross-sections that natural uranium can be used as the fuel.

A few materials have such a high absorbing power for neutrons that they are used because of this property for control or safety purposes, the rate of fission being regulated by movement of rods relative to the fuel in the fission zone.

Most elements as a result of neutron bombardment become radioactive, and for long periods subsequently some emit penetrating γ-rays of an intensity sufficient to present a radioactive health hazard. In components which have to be withdrawn from a reactor for examination, chemical processing or disposal, the amount of such elements must be restricted to an acceptable maximum. When incorporation of, or contamination by, such elements is necessary or unavoidable, parts must be designed and fabricated in the knowledge that maintenance can never be carried out or, exceptionally, only after the lapse of a prolonged period of time following reactor shut-down.

* U.K.A.E.A. Industrial Group.

Reactor Core

The reactors in operation in this country are principally of the heterogeneous type, the core consisting of a fuel, generally uranium enriched or in its natural state, physically separated from the moderator.

In the heterogeneous type of reactor, the heat produced by fission of uranium is carried by a coolant to the heat exchanger, and to protect the uranium from the action of the coolant and moderator some sort of envelope is necessary. The function of this envelope varies according to the type of reactor, but in every type where metallic fuel is used, it must prevent reaction between the coolant or moderator and the fuel. In general, the process of protection is called "canning," and the protective envelope, whether discrete or bonded, is called a "can."

The basic requirements of a canning material are the same for all reactors, but the importance of each will vary with the type of reactor.

This combination of fuel and can, called the fuel element (Fig. 1), presents the greatest problems of material selection encountered because the operating temperature is the highest in the reactor system and it is subjected to the most severe thermal gradients, and densest neutron flux. As a result of the studies carried out to enable suitable canning materials to be selected, attention has been directed to elements formerly regarded as rare, and, with the stimulus thus provided, great advances have been made in the development of such metals for engineering use.

Fuels

The properties of the fuel can vary appreciably. The fuel may be solid, liquid or a slurry and need not necessarily be metallic. As a solid it may be designed as a load supporting member but if it has low strength it may require support by the canning material. The strength can be modified by alloying, but any addition made for

this purpose must not appreciably affect the overall neutron capture cross-section or the chemical processes which follow irradiation.

While the basic fuel material for all reactors is uranium —a mixture of the main isotopes, U238 99·28 per cent, U235 0·72 per cent—which occurs naturally as an oxide, the use of plutonium and thorium is a major factor in future nuclear power development.

Reactors using natural uranium as a fuel are so seriously affected by neutron absorbing substances that new standards of purity are essential. Boron and other elements with great powers of absorbing neutrons must be removed to limits maybe as low as one part per million. The need to avoid contamination and the reactive nature of the materials employed has led to the development on a large scale of vacuum casting techniques and special refractories.

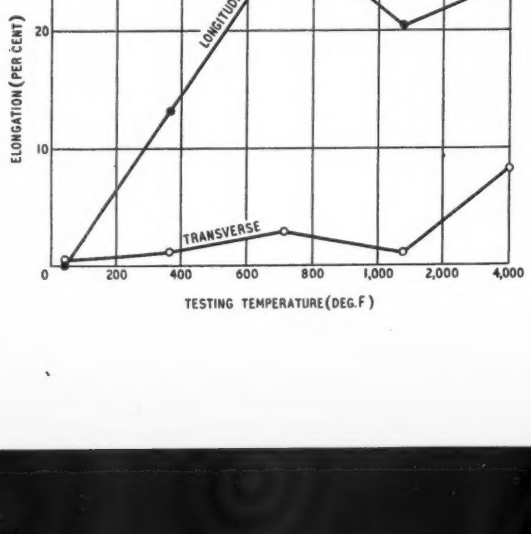
Fuel may be required in the form of cylinders, prisms, sheet or tubes, but the production of these forms does not present particular difficulty. Apart from casting and mechanical working, uranium has been shaped successfully by powder metallurgical techniques and densities approaching the theoretical density of the solid have been obtained in sintered products.

Thorium occurs extensively in monazite sands, but the ores are much more difficult to treat because of the presence of the chemically similar rare earths. The metal is so ductile that in fabrication large reductions are permissible between intermediate anneals, and the metal can be worked either hot or cold. It must be heated in a salt bath or a protective atmosphere because it is so reactive.

Plutonium, which is formed by neutron absorption and beta decay from U238, is separated from the uranium by a series of processes which must be carried out behind shields and under remote control because of the radioactivity involved. The metal is produced from its compounds by reactions similar to those used for uranium and thorium. It has a comparatively low melting point (640 deg C), exhibits at least five crystal structure modifications in the solid state, and is an extremely toxic substance.

Large programmes of research and development are under way to establish the best means of introducing these materials into reactor systems. An alternative to the use of plutonium is to enrich uranium artificially in the 235 isotope. This is extremely expensive, and wastage during processing must be avoided. Such fuels require precision techniques for casting or shaping which will produce fuel shapes in their finished form without recourse to extensive machining as the final operation.

Fig. 2.—Variation with temperature of longitudinal and transverse tensile elongations of extruded beryllium



Until recently, most of the work on fuel was applied to the development of economic methods of extraction and fabrication of natural uranium. When the method of extraction of the uranium is changed, major variations in properties such as strength at high temperature can be introduced. The fuels needed now require uranium of controlled purity, from which alloys can be made under controlled conditions with properties predetermined for the particular design of reactor.

Canning Materials

The most restrictive requirement for a thermal reactor canning material is the low neutron capture cross-section which is essential, although additionally there must be no chemical or metallurgical reaction with the fuel or coolant under any conditions of temperature and pressure likely to be encountered in the reactor. The canning material after satisfying these needs may be required to restrain the fuel during its various changes of shape and dimensions due to the effect of heat and irradiation or, alternatively, to accommodate such effects, it may have to deform without fracture.

On this basis only a few metals such as beryllium, magnesium, zirconium and aluminium are suitable for use in thermal reactors. The technology of magnesium and aluminium is now well established, although intensive development work was necessary with each before the essential standards were achieved. The maximum operating temperature at which a fuel element can operate is largely determined by the melting point of the canning metal, and beryllium and zirconium could, other factors being equal, permit operation at a higher temperature than magnesium or aluminium. Both of these metals, practically unknown a few years ago, are the subject of intensive development programmes.

For fast fission reactors to operate at higher temperatures than thermal reactors the range of possible metals can be extended to include niobium, molybdenum, steels, chromium, titanium, nickel, tantalum and tungsten. Of these, nickel and iron react with uranium at temperatures close to 700 deg C and this limits their application, whilst the remainder are metals which in pre-war years were found only as laboratory curiosities or as alloys for use as additions to the more common metals such as steel. The problems associated with the supply of some of these metals in a form suitable for fabrication are principally metallurgical in character and have to be solved before the full potentialities of each can be assessed and realised.

The principal source of beryllium is beryl ore (3 BeO, Al_2O_3. 2 Si O_2), from which the metal may be extracted by a number of alternative complex methods. Various advantages are claimed for each and some of the methods are so far largely exploratory. The metal has a close-packed hexagonal crystal structure with an abnormally low axial ratio. Extrusion results in preferred orientation and this has a significant effect upon the mechanical properties. It shows a high modulus of elasticity (40×10^6 p.s.i.), a moderately high tensile strength, low Poisson's ratio (0·05-0·1) and low values of ductility.

For extruded bar, typical values of elongation at room temperature would be 2 per cent and 0·2 per cent in the longitudinal and transverse directions respectively, although ductility increases with temperature, as shown in Fig. 2. The use of powder metallurgy techniques reduces the degree of anisotropy of finished forms and offers advantages. Although the high-temperature creep strength is fairly high the ductility at rupture is low, and this presents one of the major problems in the development of beryllium. Although it is one of the most

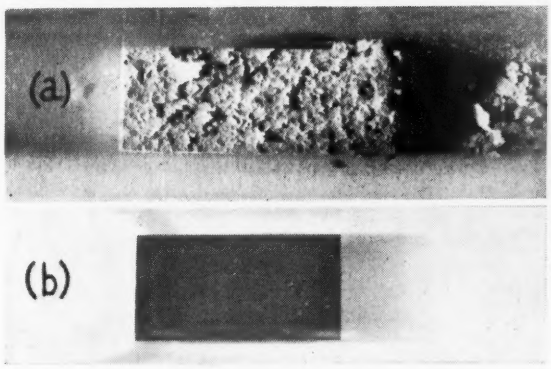


Fig. 3.—Comparison of corrosion resistance of zirconium and zircalloy 2 in high-temperature water. (a) Arc melted zirconium exposed in water for 800 hours at 325 deg C. Loose oxide is visible in the glass container. (b) Zircalloy 2 exposed for 1,600 hours at the same temperature

attractive metals from the nuclear aspect its successful application depends upon achieving a satisfactory and economic process for extraction and fabrication of the pure metal. The metal and its compounds are so toxic that dust and fumes associated with processing can be tolerated only at very low levels of atmospheric concentration. This adds further difficulty to most operations.

Compared with beryllium, zirconium ores are relatively widespread, zircon ($Zr\ Si\ O_4$) being the most common. The metal is commercially available in limited quantities using the Kroll process which yields sponge zirconium, in contrast to the " crystal-bar " zirconium produced by the de Boer iodide process. Hafnium, an element appearing in the same group of the periodic table, has almost identical chemical properties, occurs invariably with zirconium, and possesses an objectionably high thermal neutron capture cross-section. It is therefore essential to keep the hafnium level in zirconium to an extremely low value if it is to be of service as a canning material. This demands more complex and expensive separation techniques than are necessary when the metal is used principally for its corrosion resistance.

Zirconium, also of close-packed hexagonal structure, has an axial ratio near to the ideal and shows, in contrast to beryllium, fair mechanical properties, high ductility and is easily fabricated. Its strength and corrosion resistance decrease appreciably with increasing temperature, but these properties can be improved by alloying, alloys with tin (the zircalloy series) being the most common (Fig. 3). The metal presents no toxic hazards and is ideal for many reactor applications. The presence of hafnium and the need for alloying limit the use of commercially available metal.

Although niobium was previously virtually unknown except as an alloying element in steel, the potential properties of niobium are of such interest that new techniques have been developed to obtain the metal in a pure form free from tantalum which invariably occurs with it. The special problems associated with its extraction, fabrication techniques and the properties of the metal have been described in detail in a recent symposium.* The metal which is attached by caustic alkalis is resistant to most acid and aqueous media except when fluorides are present. In oxidising atmospheres at temperatures of about 500 deg C oxidation proceeds by a linear law. The metal is satisfactory for use with pure liquid metals such as lithium, sodium, mercury, tin, bismuth and lead which may be used as heat-transfer agents. The presence of oxygen in molten sodium must be restricted to exceedingly small amounts because of a significant increase in corrosion rate of niobium in the oxygen-bearing liquid metal. This control of oxygen is one of the most important factors in the successful use of liquid sodium as a coolant in nuclear power production.

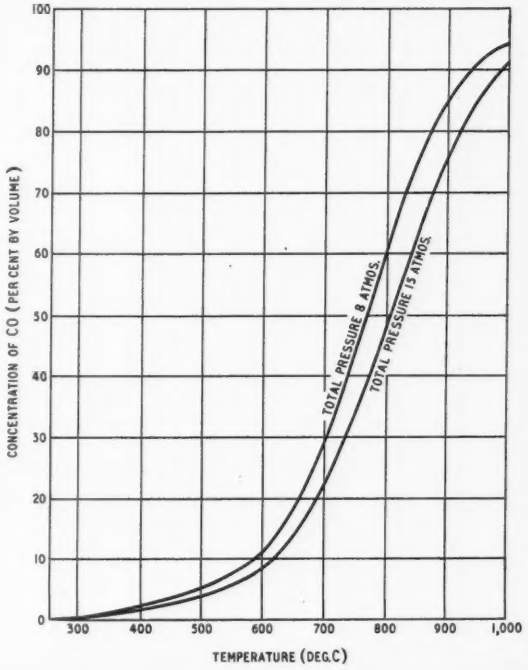
The properties of niobium illustrate the wide field of potential applications for this element. Its melting point exceeds 2,000 deg C and the metal retains its strength up to moderately high temperatures. The mechanical properties, especially the ductility, are dependent on the gaseous impurity content. In the annealed condition it is both soft and ductile and can readily be drawn, stamped, or forged into complicated shapes. Its rate of work-hardening is much lower than that of most other metals. Niobium can be machined with ordinary steel tools and can be welded. It is a relatively good conductor of heat and electricity. The work function of niobium is the lowest of any of the pure refractory metals with the exception of hafnium. It possesses the property of forming a stable oxide under the action of an electric current in acid solution.

The Moderator

In a thermal reactor the moderator must have a low absorption cross-section for thermal neutrons, and a high scattering cross-section so that it is capable of rapidly reducing neutron energy. Apart from suitable nuclear properties, it must have stability under irradiation, adequate strength, ease of fabrication and compatibility with all materials with which it comes into contact. It must also be readily available. The only solid satisfying these demands is carbon (atomic weight 12), and consequently graphite has been used in the majority of reactors, and presents a unique group of problems.

From room temperatures up to 1,000 deg C the strength of graphite changes little. It possesses a high thermal conductivity and is not susceptible to rupture or

Fig. 4.—$C/CO/CO_2$ equilibria at various temperatures



* " Symposium on Niobium," J.Inst.Metals (1957), 85, (8), 367–392.

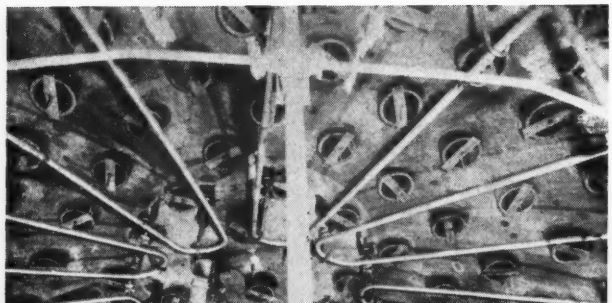


Fig. 5.—Roof interior of the Calder Hall pressure vessel immediately before sealing for stress relieving, showing the electrical heaters

" spalling " under the severe thermal gradients found in a reactor. Under irradiation at low temperatures it is susceptible to growth and when used in an oxidising atmosphere such as carbon dioxide there is a limitation on temperature because of oxidation.

Only a graphite containing as few contaminants as possible may be used, not only because of the possibility of increase in oxidation but also because neutron capture cross-section must be as low as possible. This has been achieved by using purer raw materials than are usual or necessary for the manufacture of ordinary commercial graphite for furnace electrodes or normal refractories, e.g. boron, calcium and ash contents in pile graphite are maintained at much lower levels.

Graphite, an economic moderator, is likely to be preferred for use in future reactors operating at higher temperatures than Calder Hall, but for this purpose it is necessary to improve the resistance to oxidation or solution by the coolant gas. With carbon dioxide the formation of monoxide involves the dissolution of the graphite to an extent which increases with increasing temperature (Fig. 4). Mass transfer can occur, because the carbon monoxide formed in the hot core of the reactor may decompose and deposit carbon in the more remote, cooler components. This type of reaction is common to many systems where the direction of a reaction is temperature dependent and so, in reactors with their relatively hot cores and cooler heat exchanger circuits, vigilance must be maintained for signs of it. The extent of such a reaction must be controlled since, in the extreme case, a heavy carbon deposit can form in the coolest part of the system. The simplest way to prevent this reaction is to produce a protective coating for the graphite, which will be impervious to the coolant gas and have nuclear properties similar to those of an efficient moderator. Much effort is being applied to the development of a suitable treatment for graphite or, alternatively, of an impermeable, dense, and non-reactive graphite which will be stable under irradiation.

Other Reactor Components

Although the bulk of development work has been focused on the materials for use in the reactor core, the supply of materials for what are regarded as more conventional components has necessitated careful selection and the raising of normal engineering standards. Practically every component material has been subjected to some change in standard specification to make it suitable, but the example described below typifies the rigorous demands made on orthodox materials.

The pressure vessel of the Calder Hall reactor represented a welded steel structure of dimensions comparable to the largest of similar structures. Maintenance of the structure during reactor life would be exceedingly difficult, and rigorous inspection techniques were necessary before the vessel could be commissioned. A steel was selected having properties such that the occurrence of brittle fracture was remote and site welding procedure was carefully controlled and checked by radiographic examination. The vessel was stress-relieved by electrically heating to 600 deg C, a procedure not previously considered to be feasible on a vessel of this size. Fig. 5 shows the heaters in place near the roof of the vessel.

The maximum temperature of the pressure vessel of the Calder Hall reactor is such that creep of the steel does not present a major problem. Future reactors designed to operate at temperatures of 400-500 deg C may require a steel for which the creep strength is critical. This temperature range lies outside those normally encountered in conventional power station practice with the result that development of suitable steels has become necessary. The steel must not only have adequate high-temperature strength and ductility before rupture but these values must be stable under irradiation and over long periods of time at temperature. Thus, before a new steel can be regarded as suitable the stability of its properties for periods up to 200,000 hours (23 years) must be carefully estimated, particularly with respect to time-dependent phenomena such as precipitation. Additionally, the steel must be amenable to site welding, fabrication in the form of thick plate and possess little susceptibility to brittle fracture.

Conclusions

The successful application of nuclear energy industrially has necessitated rapid strides in the advancement of the technology of new and existing materials. The refractory metals suitable as canning materials are difficult to extract in a state of sufficient purity; they are also sensitive to small amounts of impurities and are not oxidation resistant. They are therefore only successfully fabricated under conditions of the strictest atmospheric control. A rewarding field of research is presented in the development of alloys which will show increased oxidation resistance.

Frequently the supply of a suitable material has been almost non-existent, and development has opened up a new field of materials which have uses beyond the scope of atomic energy. Most conventional materials, notable examples being steels, aluminium, magnesium and graphite, have to be obtained to standards of quality and/or purity hitherto not attempted on a commercial scale. These essential advances have led to improvements in testing techniques, in the sensitivity of chemical analysis and in other fields associated with their use. Whilst the demand for new and higher quality materials has resulted in considerable progress being made, further materials development continues to facilitate the design and manufacture of reactors operating with greater efficiency.

The author is indebted to the McGraw-Hill Book Co., Inc. (New York), for permission to reproduce Fig. 2 from " Reactor Handbook Materials " (U.S. Atomic Energy Commission).

Telephone Automation

Proposals Outlined in Government White Paper

IN a White Paper (Cmnd. 303) which was presented to Parliament by the Postmaster General last week details are given of two big steps which the Post Office is taking towards full telephone automation. The Post Office will press on quickly with a system in which all numbers are obtained automatically and charges for calls are recorded mechanically. This will give a better service at lower cost. Firstly, a simpler method of charging for calls will be introduced and this will pave the way for full automation.

The Post Office now has some 6,000 exchanges, each with its own list of charges based on " crow-flight " distances to all the other exchanges. On 1st January, 1958, these 6,000 charging units will be reduced to about 600 by combining exchanges into groups. The groups will usually reflect local community of interest. Naturally they will be of various shapes and sizes but the average radius will be about seven miles. All exchanges in a group will have the same list of charges, all distances being measured from and to a central point. For 3d any subscriber, whether he has a dial telephone or not, will be able to call any other subscriber within his own group and within all adjoining groups (with very few exceptions).

Extension of Local Charge Area

To-day a 3d charge covers about 80 square miles and after 1st January this will be enlarged to about 900 square miles. Much automatic equipment now installed cannot be fully used solely because it is not capable of recording the present complicated charges. With only minor additions to present equipment there will be a quicker service; 150 million calls a year now handled by operators will be dialled direct by subscribers.

Charges for trunk calls take into account three elements: rates for a given mileage, chargeable mileages, and time. By taking the distance between centres of groups instead of between individual exchanges some chargeable mileages will be reduced and others increased.

The second step which the Post Office will take in this reorganisation of the telephone system has for its goal nothing less than full automation; it will revolutionise the trunk services and subscribers will be able to dial anywhere in the country.

Subscriber trunk dialling needs a system of national telephone numbers. Subscribers will keep their present numbers, but for calls from distant parts of the country extra numbers must be dialled in front of the existing ones. These extra numbers will do the work now done by an operator. The heart of the new system is an electronic equipment which will interpret the numbers dialled and route calls in the required direction. It will operate switches at intermediate telephone exchanges until the required exchange is reached, and will then dial the number on that exchange. Its full name is group routing and charging equipment, " GRACE " for short. Under the new system local calls will be made exactly as at present, but in the case of trunk calls the national number will be dialled. All national numbers will start with " 0 " which calls " GRACE," and it will be necessary to dial 100 to call an operator.

At present the operator makes out a separate ticket for every trunk call. This involves an elaborate and costly system of accounting. Under the new system the existing meter at the telephone exchange will register all call charges and thus eliminate the possibility of error as well as saving money.

A subscriber will be able to rent a separate meter at his premises for about 15s a quarter. This will indicate the cost of an individual call (after which it may be reset) and also show a running total.

An entirely new method of charging for trunk calls will be used which will mean the abolition of the existing large minimum charge. With this new system the minimum charge will be the local call charge. When a subscriber dials a number his meter will register once when the call starts and again at intervals, depending upon the distance involved, until the call is finished. Each registration is equivalent to one local call charge, so that a call can be made to any part of the country for a few pence, although over long distances such a call would have to be of short duration. There will be no " pips " to show the lapse of time, firstly because present equipment cannot be used, and secondly because a three-minute interval would have very little significance with the abolition of the three-minute charge.

Great savings will be made by substituting machines for people on routine work and in ten years the Post Office expects to save about £15 million a year.

The Bristol telephone exchange will be the first to be converted to the new system and here " GRACE " will be supplied by the General Electric Co., Ltd. By the end of next year subscribers in that city will be able to dial about half the subscribers in the country. By the end of 1960 forty other towns will be similarly equipped and by 1970 three-quarters of all trunk calls will be dialled by subscribers.

Extended Coverage for Independent Television

DESPITE the restrictions on capital expenditure, the Independent Television Authority state in their annual report for the year ending 31st March, 1957, that they may be able to improve on their original aim of bringing 11 stations into operation by 1959-60, and providing a service by then for some 90 per cent of the population. It is now thought possible to build 15 or more stations by 1960 and these would give a service to some 95 per cent of the population.

Because the I.T.A. have only a small engineering department, their annual report, unlike that of the B.B.C. (reviewed last week), contains little of specifically technical interest. The Authority now has in operation five stations, in London, the Midlands, Yorkshire, Lancashire and in central Scotland, with effective radiated powers ranging from 100 kW to 475 kW. The sixth station, at St. Hilary, Glamorganshire, is planned for operation next month and will have an output of 200 kW e.r.p. Work is also in progress on the South of England station at Chillerton Down, I.O.W., and its power of approximately 100 kW e.r.p. will be radiated landwards over a semi-circle, back radiation over the sea being the minimum. By the end of 1957 the Authority expects to have 800 miles of vision links in use, 90 per cent of which will be two-way circuits.

Ilgner Flywheel Equalising Sets

Prospects of their Continued Use Discussed

By F. L. PARKIN and D. PEARSON*

THE conventional Ilgner design, incorporating a prime mover coupled to a flywheel and thence to electric generators which in turn feed a large reversing d.c. motor or motors, has been utilised largely by the steel industry for primary rolling mills and by the coal industry for electric winders. Its purpose was to "equalise" the load, or more correctly to smooth out the heavy load fluctuations imposed upon the supply mains, whether by private generation or by bulk supply from the public electricity authority. In either case, a heavily fluctuating demand was, and still is, within limits, a nuisance to the generation engineer.

Application of the stored energy of the flywheel to meet peak demands is sound engineering practice, and the Ilgner system has satisfied the needs of industry for the space of some 55 years. Nevertheless, it suffers from certain imperfections, and engineers are now seeking alternative and more efficient means of handling heavily fluctuating power loads. The wider application of the two-part power tariff throughout the country has some considerable bearing on this subject.

First let us study the imperfections before dealing with the remedy. These can be summarised thus:—

(a) The Ilgner driving motor must be of the slipring induction type, and the continual use of slip regulation (even though entirely automatic in operation) involves considerable losses in rotor resistance.

(b) There is no control over power factor, the average of which is generally poor over the working range. Typical figures are 0·22 on light load, 0·9 full load, with an average over the duty cycle of about 0·83.

(c) The Ilgner set is bulky, it requires very heavy foundations, and the substantial flywheel introduces mechanical problems in bearing design and lubrication.

(d) In emergency the set cannot be brought to rest quickly. The usual minimum period required to stop a modern set with d.c. injection braking is about 2½ min.

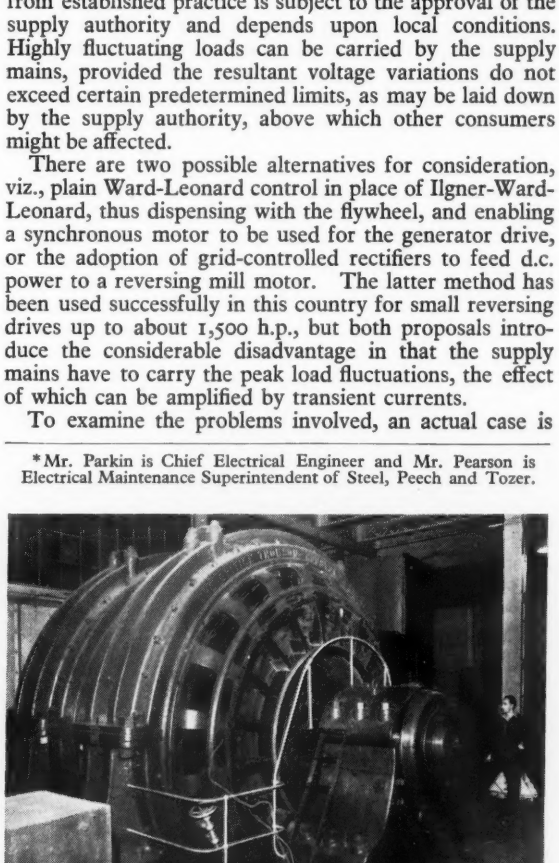
(e) The capital cost of equipment and of the associated civil engineering work is high, owing to the large motor house, elaborate foundations and provision for overhead crane needed to handle the heaviest lift during erection and future maintenance.

In the coal mining industry, it has been authoritatively stated that, with increased available capacity in the grid lines to take care of fluctuating loads and of graded acceleration for the latest winder motors, the demand for flywheel sets in new installations is rapidly disappearing. Even though the power requirements of primary rolling mills are generally higher than those of colliery winders, one might reasonably expect a similar trend in the steel industry, but any proposal to depart from established practice is subject to the approval of the supply authority and depends upon local conditions. Highly fluctuating loads can be carried by the supply mains, provided the resultant voltage variations do not exceed certain predetermined limits, as may be laid down by the supply authority, above which other consumers might be affected.

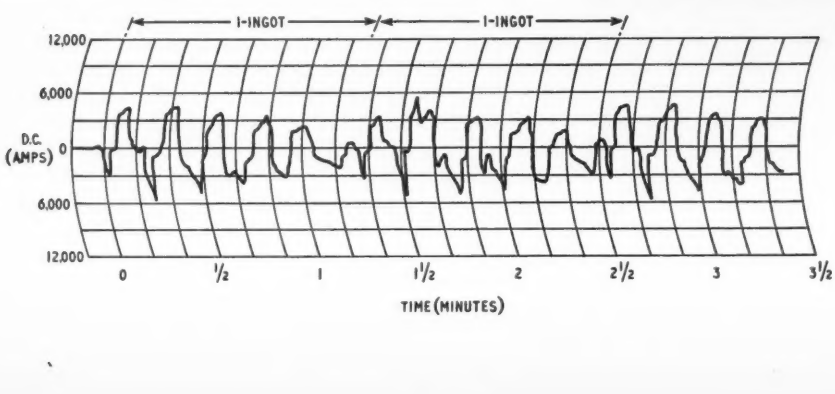
There are two possible alternatives for consideration, viz., plain Ward-Leonard control in place of Ilgner-Ward-Leonard, thus dispensing with the flywheel, and enabling a synchronous motor to be used for the generator drive, or the adoption of grid-controlled rectifiers to feed d.c. power to a reversing mill motor. The latter method has been used successfully in this country for small reversing drives up to about 1,500 h.p., but both proposals introduce the considerable disadvantage in that the supply mains have to carry the peak load fluctuations, the effect of which can be amplified by transient currents.

To examine the problems involved, an actual case is

*Mr. Parkin is Chief Electrical Engineer and Mr. Pearson is Electrical Maintenance Superintendent of Steel, Peech and Tozer.



Above: Fig. 1.—Reversing mill motor, 6,000-15,500 h.p., now being replaced by one of greater capacity



Left: Fig. 2.—Typical d.c. load chart for old 6,000 h.p. motor

now cited of a 42in cogging or blooming mill, on which the authors are at present engaged in replacing the drive equipment with machines of larger h.p. to meet the demand for increased steel production (see preliminary report, page 253 of the *Electrical Review* of 8th February, 1957).

A new mill motor of 7,000 h.p. continuous rating (17,500 h.p. peak) with base speed of 50 r.p.m. and top speed of 100 r.p.m. by field weakening, will replace the original motor of 6,000 h.p. rating (15,500 h.p. peak). It will be a double-armature machine, capable of reversing from base-to-base speed in $1\frac{1}{2}$ seconds, in place of $2\frac{1}{2}$ seconds with the older design. Fig. 1 illustrates the old 6,000 h.p. motor, and Fig. 2 shows a typical d.c. load curve when rolling $22\frac{1}{2}$in square ingots to $7\frac{1}{4}$in blooms in 11 passes.

The complete duty cycle for the rolling of a $3\frac{3}{4}$ ton steel ingot at present occupies 75 sec (the ultimate objective by improved methods of manipulation and quicker acceleration is 60 sec). During this period 11 load reversals have taken place, starting with short sharp peaks and reducing to sustained peaks of less amplitude as the hot material is elongated during the rolling process.

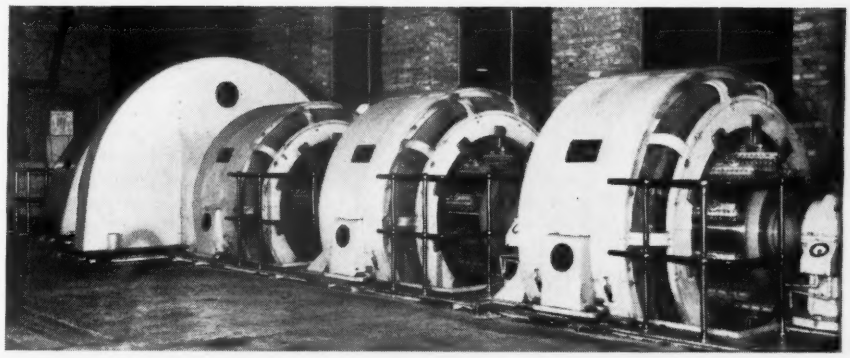
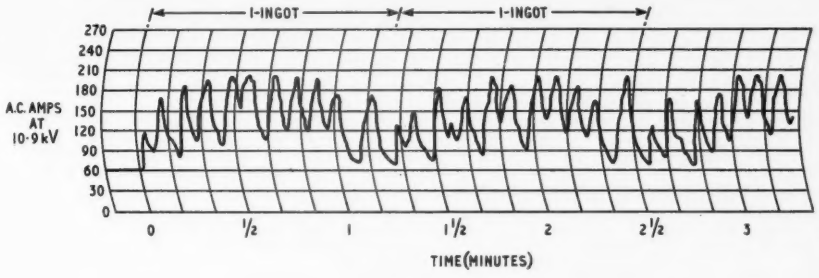
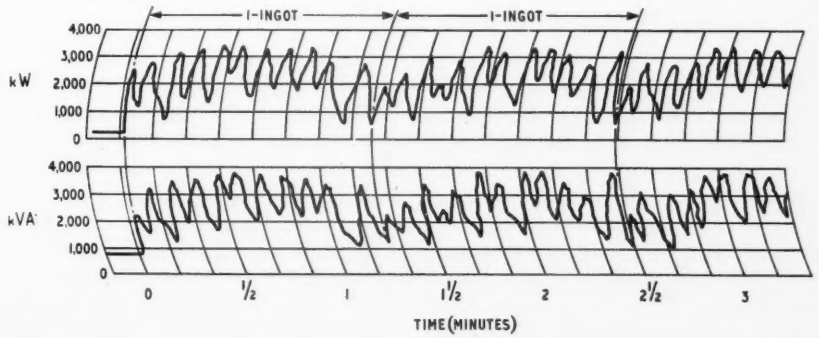


Fig. 3.—Newly commissioned 5,000 h.p. Ilgner-Ward-Leonard set



Figs. 4 and 5.—Load charts for Ilgner-Ward-Leonard set ; a.c. amperes, and kW and kVA



In contrast, the colliery-winder cycle, made up of distinct periods of acceleration, top speed (raise or lower), deceleration, and "decking time," involves only one reversal per wind of 30 to 60 sec duration, depending upon the depth of the pit shaft. The original patents by Carl Ilgner in 1901 were primarily devised for winding engines, and later applied to reversing mills, but the steelworks application is much more arduous even on an equal h.p. basis.

A detailed examination of alternative sources of power now follows. The first is the Ilgner-Ward-Leonard drive, as illustrated in Fig. 3. This involves a 5,000 h.p., 600 r.p.m., slipring induction motor, a 14ft dia. flywheel weighing $28\frac{1}{2}$ tons and having stored energy of 175,000 h.p.-sec, and three 1,860/4,650 kW d.c. generators, all direct-coupled. The Ilgner motor stator is wound for an 11 kV power supply. Fig. 4 shows the a.c. load curve corresponding to the fluctuating d.c. demands of Fig. 2, and therefore the effect of the flywheel in "smoothing out" the load peaks. These graphical records were taken simultaneously by recording ammeters. In Fig. 5 are shown the corresponding kW and kVA load curves. In the absence of additional recording instruments, these curves were assessed from the chart of a.c. current, with full and accurate knowledge of the variations in motor power factor from the switchboard indicating instruments.

The results show an average a.c. load of approximately 2,035 kW input or 2,450 kVA which is the average half-hour maximum demand. The duty as such is comparatively light for a 5,000 h.p. generator with a peak of only 3,800 kVA. However the mill d.c. motor will shortly be changed from 6,000 to 7,000 h.p., and the duration of the duty cycle lowered by 20 per cent. It follows that the rolling peaks will increase considerably, and will probably reach the maximum h.p. rating during one or more of the early passes.

From the point of view of optimum demand on the power mains, and its contribution to variations in supply voltage, the fair basis of assessment is that of the designed peak loading on the Ilgner motor. With correct adjustment of slip regulation, a peak value of 150 per cent of full load on the 5,000 h.p. motor, or 6,550 kVA, can be expected. This peak can be reduced to an estimated figure of 6,100 kVA by adding banks of high-voltage

capacitors rated at 1,000 kVAr to correct the full-load power factor to 0·97 lagging.

While the example quoted is that of a fairly large primary reversing mill, particularly for a single-motor drive, it is by no means the largest in use in this country. The installation of greatest h.p. is, to the best of the authors' knowledge, in a South Wales steelworks consisting of a modern twin-motor drive of 9,200 combined horse-power and fed from a 6,600 h.p. Ilgner set. On the other hand, a British manufacturer has built a twin-motor drive totalling 12,500 h.p. complete with a 9,000 h.p. Ilgner motor-generator set, destined for a large steelworks in the Dominions.

The problems of peak demand on the supply mains are identical whether a single- or a twin-motor drive is employed. In the first case, the mill rolls are mechanically coupled through heavy reduction gears, and in the second the two rolls are individually driven and coupled electrically only.

A second alternative is the synchronous Ward-Leonard drive, which to perform the same function as the preceding example, but without a flywheel, needs an 8,400 h.p., 600 r.p.m., unity power factor, synchronous motor for direct coupling to the three 1,860/4,650 kW generators. The machine must be designed to handle a working peak corresponding to that of the new reversing mill motor (17,500 h.p.). Allowing for motor and

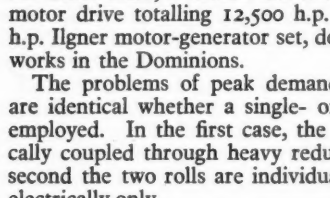


Fig. 6.—Peak demand (estimated) with synchronous Ward-Leonard drive

generator efficiencies, an a.c. peak rating of 2½ times full load, or 16,500 kVA input, is required.

As before, the stator can be wound for 11 kV, but if, in view of the peak demand, it is supplied by a separate step-down transformer (66/11 or 33/11 kV), the continuous rating of the latter should not be less than 9,000 kVA.

From technical considerations, the advantages to be achieved are twofold. One is an improvement in overall efficiency by the elimination of the windage losses in the flywheel enclosure and, more important still, by the deletion of the appreciable slip-regulation losses; the result is a lower average kW input or less kWh consumed per ton of steel rolled. The other is a lower average kVA input, in spite of the higher working peaks, and therefore an improvement in kVA of maximum demand, which again affects the power bill.

On the debit side the scheme introduces the problem of " overswing " or transient current in the supply mains, because the proposed Ward-Leonard motor is tied to synchronous speed and lacks the flexibility of a slipring motor and flywheel. Consequently, the effect of rapid reversals on the mill motor shows up as current swing in the stator circuit of the synchronous motor. Oscillograph records taken on a typical 2,420 h.p. synchronous m.g. set feeding a reversing mill motor, have led the authors to expect a peak load condition roughly as illustrated in Fig. 6. The estimated curve, drawn on an extended time scale, deals only with the worst peak in the rolling cycle taken from Fig. 2. This occurs on No. 3 pass just prior to which the partly rolled ingot has been turned on its axis through 90 deg.

The normal peak demand on the a.c. mains is now directly dependent upon the peak load imposed upon the d.c. mill motor and, assuming that the full peak rating of the machine will be used at No. 3 pass, an a.c. working peak of 16,500 kVA will obtain. Superimposed on this is the transient peak due to overswing, making a total of roughly 185 per cent, that is 30,500 kVA. Tests have shown that the transient peaks are fairly well damped, and that with controlled excitation the current oscillations can be expected to have a periodicity from 2 to 3 c/s. Nevertheless this can cause some voltage fluctuations in the supply system; hence the suggestion that the set might with advantage have its own 9,000 kVA transformer so that any such fluctuations are absorbed in the 33 or 66 kV supply network, where the effect can be deemed negligible.

As a compromise, it would of course be possible to use a slipring induction motor in place of a synchronous machine, and to allow the natural slip of the motor to give some " cushioning effect "; the economics of the two alternatives might well be worth investigation. It would certainly reduce the severity of the transient kVA, but it would sacrifice the advantage of running the motor at near unity power factor, independently of load. Static condensers would therefore be desirable to give some measure of power factor improvement.

The largest synchronous m.g. set with which the authors are acquainted for use in this country on a reversing mill application, is one at present in course of installation at a Sheffield steelworks. The mill however consists of a 4-high finishing stand for the rolling of 42in wide stainless steel strip, involving relatively long passes, and the sustained load peaks make conditions less arduous. The synchronous motor is rated at 7,000 h.p., and the corresponding twin d.c. mill motors at 5,600 h.p. The typical duty cycle will be three to five reversals within 1·5 to 2·5 min depending upon the rolling schedule.

In a steelworks in the Detroit area of the U.S.A., a 7,000 h.p. twin-motor reversing-mill drive (installed in 1950) is successfully fed from a synchronous-motor-driven generator, and handles a d.c. peak power of 19,000 h.p. Published reports indicate a working peak on the synchronous motor of 17,000 kVA with a transient of twice the working peak.

Grid Controlled Rectifiers

Mercury-arc rectifiers have not yet been used in this country to supply large reversing-mill motors, but on the Continent electrical companies have manufactured and installed large rolling mill equipment of this type. The introduction of grid control made this possible. The principle of Ward-Leonard control can be applied in such cases. Variable-voltage control is obtained by using two grid-controlled rectifiers, one to supply current in the forward direction, the other being connected to drive the motor in the reverse direction. Regenerative braking is obtained by using either rectifier as an inverter, the change taking place at zero current in the armature circuit. This is brought about by reducing the load on the rectifier for forward direction and controlling the rectifier for reverse direction so that it will accept the regenerated current as an inverter. The inverter voltage is then reduced until the speed nears zero, when the voltage is raised to run the motor in the reverse direction. The control from base speed to maximum speed by field weakening is obtained by grid-control of a separate smaller rectifier supplying the field of the motor. A

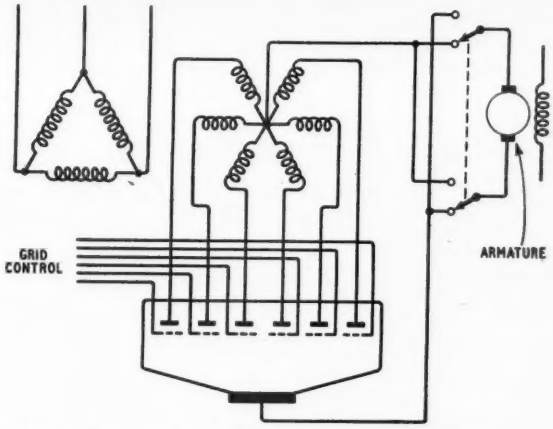


Fig. 7.—Single rectifier connection with armature reversal for d.c. mill motors

single rectifier can also be used in place of the double rectifier to supply the main current.

The following three methods are in use for controlling reversing motors fed from rectifiers:—

(a) By cross-connection of two rectifiers or sets of rectifiers, quick reversal is obtained, with regenerative braking by inverter operation.

(b) By control of rectifiers in the main circuit and reversal of the mill motor field under grid-control of the motor-field rectifiers.

(c) By reversal of the armature circuit, using switching contactors to operate at zero current in the rectifier-armature circuit. Fig. 7 shows the main connections.

The chief objection to (a) is the cost of providing the extra rectifiers required for inversion. Method (b) using main-field reversal is not suitable for high production mills, owing to the slow operation caused by the inherent hysteresis of the magnetic system. Scheme (c) using contactors to reverse the armature current appears to be the best arrangement, as a single bank of rectifiers operates also as an inverter during deceleration of the motor. Very rapid acceleration and deceleration, limited only by the commutating ability of the motor, is possible. With this scheme, one would expect higher maintenance costs in connection with the reversing contactors, particularly as the number of reversals for an output of one ingot per minute in 11 passes will be 660 per hour, but very little information is available in this country on the design and reliability of reversing equipment used for this purpose.

British rectifier designers are expected to favour the method using armature current reversal by means of some form of switching. With rectifier-fed reversing motors, the peak loads, as with the synchronous Ward-Leonard sets, have to be absorbed by the supply system, but there is no problem of "overswing." Consequently the high transient peaks indicated in Fig. 6 are eliminated. Furthermore, rectifiers show up to advantage under fault conditions, since they will not feed back into a fault on the supply side whereas, with rotating equipment, the Ward-Leonard motor, backed by the inertia of the set, can act as a generator to feed heavy current into a fault.

Taking as an example the 7,000/17,500 h.p. motor mentioned previously, with frequent peaks of 17,500 h.p., and allowing for the higher efficiency of the rectifiers, there would be imposed on the supply system an estimated demand of approximately 16,000 kVA. These fluctuating peak loads, and the very poor power factor of the rectifier at low voltage corresponding to low speed on the reversing motor, could cause disturbance in the supply system. The power factor of mercury-arc rectifiers varies roughly in proportion to reduction in voltage, and this should be taken into account in considering the use of grid control. The rectifier at the full-voltage output would need to be derated to take care of impact loads imposed on the reversing motor. A continuous output of about 7,500 kW with rating in accordance with B.S. 1698 of 1950, namely six hours at 100 per cent rated current, and either 125 per cent for two hours or 200 per cent for 15 seconds would be selected for a motor of the above output.

Rectifier installations impose heavy momentary active and reactive surges as well as harmonics on the supply system. The rectifier acts as a generator of higher harmonics, but the magnitude of the currents can be reduced by suitably displacing the phases of individual banks of rectifier transformers, as is already done in the case of large rectifier installations. Rectifiers can take high peak loads without damage, and have a higher efficiency than m.g. sets (see Fig. 8).

Considerable progress has been made since the war in the development of mercury-arc rectifiers, particularly in the multi-anode pumpless and single-anode types. Performance and reliability have been improved and they are now being used extensively in the heavy industries for supplying uni-directional rolling mill drives. A large reversing rolling mill drive was manufactured and installed in 1955 by a Continental manufacturer having twin drive motors, with a maximum power of 19,600 kW and maximum torque of 350 m.t. for both motors. The motors are fed from a double-rectifier installation with six water-cooled tanks. Reversal is obtained by means of switching contactors in the armature circuit. Two pumpless air-cooled rectifiers were provided for the supply and control of the field circuits.

Capital and Running Costs

At the present-day level of manufacturing costs, the drive equipment will involve capital expenditure of over £0·25 million, inclusive of main motor but exclusive of mill auxiliaries. The running cost in purchased power alone can be of the order of £60,000 per annum, in which case every 1 per cent improvement in overall efficiency is worth some £10,000, if capitalised over 15 years.

Our assessment of the comparative values of the three alternative schemes is as follows:—

Drives by Ilgner set and by synchronous Ward-Leonard are roughly equal in capital cost, with due allowance for the recommendation that the synchronous motor should be fed through a step-down transformer to ensure that the load fluctuations are absorbed in the 33 or 66 kV supply system. A mercury-arc rectifier in place of the motor-generator set will be slightly lower in capital cost of equipment, with additional savings to be gained in

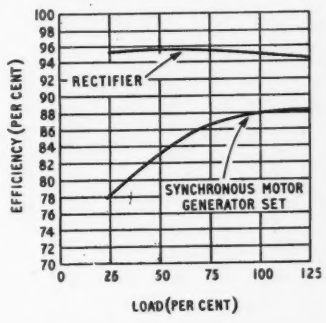


Fig. 8.—Comparative typical efficiencies of rectifier and motor-generator at 600 V

constructional costs, by reason of smaller motor house and less substantial foundations.

Annual power costs, based on the normal two-part tariffs published by the Electricity Boards, would show savings of 5 to 7·5 per cent for synchronous Ward-Leonard, in place of an Ilgner set, and 12·5 to 15 per cent for rectifiers, compared with Ilgner control, having regard to the higher conversion efficiency and to less auxiliary power used for ventilation.

Maintenance costs would also be less for rectifiers, and the authors would expect potential savings of 35 to 50 per cent with the over-riding asset of less time needed for week-end repairs. This would be of particular value in the case of plant installed for use on a nearly continuous working week, e.g. 20 out of 21 working shifts per week, leaving a mere 8 hours per week for essential maintenance. It should be appreciated of course that the figures quoted are intended purely as a general guide, and that each new mill drive must be treated individually in considering choice of motive power.

Conclusions

The problem is largely one of adequacy of power supply and, in the interests of progress, such difficulties as at present exist must be faced. The rapidly expanding steel industry is demanding from the grid system a vast increase in power supplies, a notable example of which is the arc-furnace load. Steel makers are now thinking in terms of 80 and 100 ton furnaces, requiring transformer capacity of 24 to 30 MVA per furnace. The load characteristics are highly fluctuating, particularly so during the melting or breaking-down periods.

Arc furnaces of this magnitude will no doubt be connected through step-down transformers to the local 33 or 66 kV network or, where necessary, through double transformation direct from the 132 kV grid lines. It is the authors' opinion that large reversing rolling mills should be treated similarly, in which case there should be no difficulty in handling both the working and transient peaks of a synchronous motor or rectifier installation as described in this article.

Primary rolling mills can, and will, be supplied from plain Ward-Leonard sets or from rectifiers—the future trend is likely to favour the latter for the reasons already stated—but until the Electricity Boards are able and willing to accept the resultant load peaks, industry must continue to use the Ilgner-Ward-Leonard system of control.

In conclusion, the authors wish to express their thanks to the B.T.H. Co., Ltd., for use of oscillograph records and other basic data concerning synchronous motor drives, to the English Electric Co., Ltd., for general information and to the management of the Steel, Peech & Tozer branch of the United Steel Companies, Ltd., for their kind permission to publish this review of current practice.

Printed Microwave Circuits

Discussion on I.E.E. Radio and Telecommunication Section Papers

THREE papers by Mr. J. M. C. Dukes on the application of printed circuit techniques to the design of microwave components, broad-band slot-coupled microstrip directional couplers and re-entrant transmission line filter using printed conductors were discussed by the Radio and Telecommunication Section of the Institution of Electrical Engineers on 13th November. A summary by the author of these papers appeared in the *Electrical Review* of 15th November.

Mr. L. Lewin (Standard Telecommunication Laboratories, Ltd.), recalling some of the development work on strip-line techniques, said that measurement problems had been ameliorated by the Deschamps technique. Recent developments had brought about further improvements, and consistent measurements up to 0·9 ratio were now possible. Where low weight, compactness and reproducibility were important, consideration should be given to strip-line.

Dr. Elizabeth Laverick (Elliott Brothers) suggested that microstrip had tended to be neglected on this side of the Atlantic, probably because of the lack of suitable materials. Referring to the adjustable short circuit shown in Mr. Dukes' main paper, she said that a similar plunger was used by her firm, which had also endeavoured to adopt it for the low-Q triplate line, but the mechanical difficulties were greater.

Mr. W. J. Bray (Post Office) outlined some practical applications of strip-line techniques for airborne equipment and telephone or television channels. He suggested that a detailed investigation into microwave systems providing possibly half-a-dozen or so telephone channels might be well worth while. In the three papers submitted, Mr. Dukes had made a notable contribution to design.

Mr. J. Hooper mentioned the difficulties that would be entailed in designing a repeater where high-power systems ran along low-power systems if strip-line technique was used for the microwave system described by Mr. Dukes, which consisted of a small box with two relays attached to it.

Mr. K. Foster (Cossor Radar & Electronics, Ltd.) took issue with Mr. Dukes about the measurement difficulties which were not so outstanding in the case of high-Q strip-lines. The main difficulty was setting the strip opposite the probe; as this problem had not been solved, a correction for this factor would be necessary.

Brigadier E. J. H. Moppett asked whether the patent position was not an obstacle to the use of the technique.

Mr. F. J. H. Charman said that Mr. Dukes' latest work on directional couplers might lead to fairly precise instruments. Measurement would then be much simplified. He had been able to make directional coupler detectors himself which could be balanced to 60 dB and could measure disturbances in the line well below the 1 per cent level.

Mr. W. E. Willshaw asked why Mr. Dukes' Q triplate was a low loss transmission system. It did not seem very different from the balanced line system. Mr. J. Emerson asked whether p.t.f.e. did not have a very violent kink in its coefficient of expansion just above room temperature, which might affect accuracy.

Mr. P. P. Eckersley inquired whether any tests had been made to ascertain whether the characteristic varied with temperature.

VIEWS on the NEWS

By REFLECTOR

I HAVE commented before upon the difficulty experienced by the electricity supply authorities in ascertaining exactly what appliances are in use in residences in their areas. Consumers are supposed to notify the authority of their intention to alter the maximum demand stated in their initial applications but I suppose they rarely do and most of the services put in are capable of handling far more than the originally demanded power. And so appliances are added in their thousands. It is the same in the United States. One company there, says the *Electrical World*, connected up a block of 45 new homes five years ago and found that the connected load was about 65 kVA. Rather optimistically they put in a 75 kVA transformer but this summer the transformer breaker was tripping out quite regularly. The company made another survey of the houses and discovered that the connected load had risen by 326 kVA which caused them to install a more adequate transformer. No doubt many complaints of unreliable service in this country arise from the same cause.

* * *

I remember commenting two or three years ago on a system installed in a railway waiting room by which a passenger desiring warmth could put sixpence in a slot machine which switched on an electric fire. Such a scheme was probably satisfactory where there was only one occupant but likely to remain unused if there were several people who wouldn't want to pay for somebody else's comfort. This trouble has been avoided at Petersfield (Hants) where, it is reported, a ceiling fire has been installed operated by a push-button device which gives a fifteen-minute heating period at one time. In this case the service is free and so more likely to be used.

* * *

The Central Electricity Authority gets involved in all kinds of unusual activities but surely the strangest must be that reported by the Portsmouth *Evening News*. The Authority recently took over a piece of land which was formerly the graveyard of St. Mary's Church, Old Portsmouth. The remains of several hundred people were exhumed and re-interred at Milton Cemetery in the presence of a number of representatives of the Authority headed by Mr. R. H. Coates, the controller of the Southern Division.

* * *

Recently the *Gas Journal* devoted some attention to the gas industry's methods of handling the domestic consumer and suggested that these methods did not take account of the very great social changes which had occurred in the last few years. Although some of the shortcomings referred to may be shared by the electrical industry, I think it may justifiably be claimed that our industry is more alive to the consumer's needs and prejudices. This may be because of the greater number of manufacturers serving the electricity consumer than is the case in the gas industry. The result is greater variety of choice, which, provided it is not allowed to go too far, is a good thing. The *Gas Journal* says:—

> "One of the main reasons why our sales have not expanded in recent years as they should have done is that there has been too much guesswork, too much *old-fashioned* planning."

I should have said that there was another even more potent factor—the rapid progress of the electrical industry.

* * *

Fish and power stations have again been in the news. The Duke of Devonshire, in a paper which he read at a conference of the Salmon and Trout Association, referred to the "thoughtless and needless" abstraction of water which might well mean that rivers would be virtually dry for much of the year. The only liquid in the river beds would be industrial waste water and sewage "pleasantly warmed by power stations." The Duke, as reported by *The Times*, said that someone in Whitehall had done some sensible thinking about atomic power stations.

> "The Central Electricity Authority had, in one famous case, put forward in court the suggestion that it did fish good to have their water heated all the year round, but now it was realised that overcrowding spoilt the fish, and that the great heat of an atomic station must therefore be disposed of elsewhere than in a river."

* * *

Last week I referred to the troubles of the Monmouth electricity undertaking in 1907. Ten years earlier the Salford Corporation electricity works was, according to the *Electrical Review* of 26th November, 1897, being "stifled." It was said:—

> "It is not difficult to find a reason for the ill-success that has followed the works since their initiation. The Corporation were virtually forced to become suppliers of electrical energy, and as an indication of the spirit in which they entered upon the undertaking they relegated the whole arrangements to the tender mercies of the Gas Committee. Under these circumstances it would have been surprising if the electricity system had had fair play; the Gas Committee looked upon it as a rival, and the late chairman went so far as to declare 'that the electric light was a luxury and that those who used it would have to pay for it as such.' Not only were the public practically prohibited from becoming consumers, but the actual working and management of the undertaking was hampered by the anomalous arrangement of making the resident electrical engineer responsible to the gas engineer."

There had recently been an improvement, however, for the electricity works had been placed in the hands of a special committee.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The **Rt. Hon. Thomas Johnston,** C.H., LL.D., has been reappointed to serve as chairman of the North of Scotland Hydro-Electric Board for a further period until 31st December, 1958. **Sir Hugh Mackenzie,** C.B.E., Lethington, Inverness, has been reappointed as deputy chairman of the Board until 31st December, 1959, and **Sir George M'Glashan,** C.B.E., Auchterarder, continues as chairman of the Consultative Council until 31st December, 1959. **Mr. J. Jardine,** of Montrose, is appointed a part-time member of the Board until 31st December, 1960, in place of **Mr. G. R. Mackintosh,** whose present appointment ends on 31st December next.

The Secretary of State for Scotland has reappointed **Colonel Sir John Crabbe,** O.B.E., M.C., T.D., Duncow, Dumfries, and **Sir Ronald Thomson,** D.L., Kaimes, West Linton, to be part-time members of the South of Scotland Electricity Board until 31st December, 1960, and **Sir Jackson Millar,** C.B.E., D.L., Brookwood, Bearsden, Dunbartonshire, to be a part-time member of the Board until 31st December, 1958.

Mr. Iain M. Macleod, P.C., M.P., Minister of Labour, will be the principal guest at the dinner of the **British Steel Founders' Association** to be held at Claridges, London, on 3rd December.

The Eastern Electricity Board announces that as from 1st January next the Harrow and Wembley Districts of its Northmet Sub-Area will be amalgamated and will be known as the Wembley District, with headquarters in Kingsbury Road, Kingsbury. **Mr. F. H. Long,** M.I.E.E., M.Amer.I.E.E., the present manager of the Enfield District, will be the manager and his place at Enfield will be taken by **Mr. A. T. Durbridge,** the present Harrow manager. **Mr. G. B. Pierpoint,** who formerly managed the original Wembley District, has been appointed manager of the Northwood District.

The new district will have a population of just over 300,000 and an area of 24 sq miles. There are over 92,500 consumers, of whom about 86,000 take a supply for domestic purposes. The district will possess eight service centres.

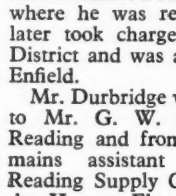
Mr. F. H. Long

Mr. A. T. Durbridge

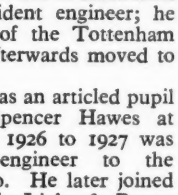
Mr. Long joined the electricity supply industry in 1918 and was with the Northmet Power Co. at Edmonton where he was resident engineer; he later took charge of the Tottenham District and was afterwards moved to Enfield.

Mr. Durbridge was an articled pupil to Mr. G. W. Spencer Hawes at Reading and from 1926 to 1927 was mains assistant engineer to the Reading Supply Co. He later joined the Harrow Electric Light & Power Co. as engineering assistant to the manager, becoming in turn the first assistant engineer and then the manager; he was appointed district manager for the Eastern Electricity Board in 1950.

Nettle Accessories, Ltd., announces the appointment of **Mr. A. J. Critchley,** M.A., as sales manager, to succeed **Mr. G. Taylor,** who has been appointed the company's agent in the Midlands and East Midlands counties.



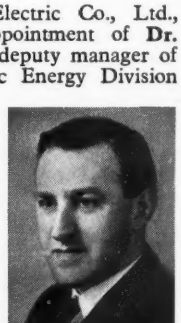
Mr. A. J. Critchley



Mr. G. Taylor

Mr. T. A. McLaughlin, D.Sc., B.E., a former chairman, and **Mr. J. M. Fay,** B.E., M.Sc., ceased to be members of the Irish Electricity Supply Board on 1st November. In 1953 they were reappointed for four years and last March their terms of office were extended by six months. Dr. McLaughlin was originally appointed a full-time member of the Board in 1927 and, except for one period of just over a year, he had been a member ever since. Mr. Fay was appointed a part-time member in 1929 and became a full-time member in 1930. The constitution of the Board is now as follows:—Messrs. R. F. Browne (chairman), J. P. Digby, H. Kennedy, M.A., D.Sc., T. MacMahon, B.E., B.Sc., and J. A. Ryan (part-time members), P. J. Dempsey, B.L. (secretary), P. G. Murphy, B.Sc., M.E., M.I.E.E., M.I.Mech.E. (chief engineer) and J. Fogarty, B.Comm., A.C.A. (chief accountant).

The General Electric Co., Ltd., announces the appointment of **Dr. K. J. Wootton** as deputy manager of the G.E.C. Atomic Energy Division at Erith, Kent, with effect from 1st November. This appointment is a new one arising out of the continued expansion of the Division's staff and activities under its manager, **Mr. R. N. Millar.**



Dr. K. J. Wootton

Dr. Wootton is thirty-six and was educated at Watford Grammar School and Imperial College, London, where he obtained a 1st class honours degree in mechanical engineering. Following a period as a research engineer with the Shell Petroleum Laboratories he joined the R.A.F. and was commissioned in the Technical (Engineer) Branch. After the war he returned to Imperial College where he obtained his doctorate for research work on heat transfer, and then joined Vickers-Armstrongs, Ltd., as a research and development engineer. In 1951 he was appointed head of the Mechanical Engineering Department, University College, Khartoum, where he remained until joining the G.E.C. in 1955. Until his new appointment Dr. Wootton was responsible for engineering research and development in the Atomic Energy Division.

Aero Research, Ltd., Duxford, Cambridge, and Ciba, Ltd., Horsham, announce that **Air Commodore Sir Arthur Vere Harvey,** C.B.E., M.P., has accepted the chairmanship of the boards of directors of these two companies. In this appointment he succeeds **Sir Raymond Needham,** Q.C., who has been chairman since 1947 and remains a director of both companies. Sir Arthur Vere Harvey served in the R.A.F. from 1925 to 1930 and formed the 615 County of Surrey Squadron, which he commanded in France in 1939-40. Since 1945 he has represented the Macclesfield Division

Air Commodore Sir Arthur Vere Harvey

of Cheshire in Parliament. His industrial appointments include directorships of Mullard, Ltd., Handley Page, Ltd. (deputy chairman), and Philips Electrical, Ltd.

Following the death of Mr. W. Yuille, reported in our last issue, William C. Yuille & Co., Ltd., have made the following changes on the board:—**Mrs. James Kerr** (the late Mr. Yuille's daughter) is appointed chairman; **Mr. J. S. McKechnie,** who was associated with Mr. Yuille for nearly forty years, is appointed managing director; and **Mr. R. W. Brackenridge,** technical estimator, becomes a director. **Mr. J. Kerr,** who was appointed to the board last year, continues as a director.

A record gathering of students of **W. T. Henley's Telegraph Works Co., Ltd.,** with their parents and friends, attended Woolwich Polytechnic on 16th November, for the fifteenth annual conversazione of the Henley Education Scheme. Sir John Dalton, chairman of the Henley companies, received the students and guests. Dr. P. Dunsheath, C.B.E., director of Henley's, opened the proceedings by outlining the facilities offered to young employees of the company under the Education Scheme. He expressed gratification in the results of the scheme, as manifested by the large number of students who had gained awards for examination successes. Sir John Dalton then presented awards to over a hundred students from Henley's head office, works and research laboratories who had been successful in their examinations, and presented handicraft awards for work shown in the exhibition.

After the prizegiving Dr. Dunsheath introduced the guest speaker, Mr. T. E. Goldup, C.B.E., M.I.E.E. (President of the I.E.E., and director of Mullards, Ltd.), who stressed the importance of the I.E.E., and director of Mullard, only from the personal standpoint, but with a view to contributing towards the country's welfare. He advised students to study human relationships, particularly the necessity of co-operation with others. In addition to mastering their jobs and acquiring a thorough knowledge of the industry, students should cultivate some worthwhile hobby. He concluded with a survey of communications of all kinds. Malcolm J. Mackay, Henley student apprentice, expressed the students' appreciation of the help and encouragement received and thanked Mr. Goldup for his address.

Mr. S. E. Goodall (chief engineer), Mr. T. E. Goldup (president, I.E.E.) and Sir John Dalton (chairman of Henley's) inspecting students' handicraft exhibits at Henley's annual conversazione

The theme chosen for this year's exhibition was "Communications." There was also a stage show by the Kerwin Players.

Proposing the toast of the **Institution of Electrical Engineers** and the North Midland Centre at the annual dinner of the Centre at the Queen's Hotel, Leeds, on 15th November, Engineer Rear-Admiral Sir Sydney Frew, Chief Engineer, Ministry of Power, spoke of the advances made in the field of electrical power over the past fifty years. Mr. T. E. Goldup, President of the Institution, responding, referred to the responsibility of the Centre in seeing that young and up-coming electrical engineers had not only the necessary academic training but also the practical training. He said: "We are an important body of people. The responsibility on the shoulders of electrical engineers in the future is going to be such that it will rest with us largely how we progress in our economy in this country."

Mr. A. J. Coveney, chairman, North Midland Centre, proposed the toast to the guests, to which the Rev. J. K. S. Reid, Professor of Theology at Leeds University, replied. The guests included Councillor B. Mather (Deputy Lord Mayor of Leeds), Mr. W. K. Brasher (secretary, I.E.E.) and representatives of other Institutions.

Mr. A. Black, C.B.E., has been appointed director in charge of the Electronics Division of Pena Copper Mines, Ltd. Mr. Black received his early training with Vickers-Armstrongs, Ltd., and subsequently gained experience with a company of consulting engineers engaged in undertakings throughout Europe. In 1931 he entered the Royal Ordnance Factories, Woolwich, where by 1938 he had been promoted to deputy chief engineer. At the outbreak of war he

Mr. A. Black

At the I.E.E. North Midland Centre Dinner

Mr. T. E. Goldup (President) and Mr. A. J. Coveney (chairman of the Centre) receive Rear Admiral Sir Sydney Frew and Mr. W. K. Fleming. Right: Mr. W. K. Brasher (secretary, I.E.E.), Rear Admiral Sir Sydney Frew, Mr. T. E. Goldup, Councillor B. Mather (Deputy Lord Mayor, Leeds), the Rev. J. K. S. Reid (Professor of Theology, Leeds University), and Mr. A. J. Coveney

was appointed Assistant Director, Ministry of Supply, and in 1941, as Deputy Director, Ammunition Production, was responsible for controlling rocket production. After the war Mr. Black acted as adviser to various Government Departments on the organisation and selection of professional engineers and was also a member of Civil Service Commission Selection Boards. He was Director, Armament Production (General), and Director of Electronic Production (Munitions). Mr. Black remained at the Ministry of Supply until his resignation this year to take up his appointment on the board of the Pena Group.

Mr. E. Atherton, A.C.I.S., has been appointed a director of Dorman & Smith, Ltd. After serving a short period with Herbert Hunt & Co., Ltd., Mr. Atherton joined Dorman & Smith in 1949 and worked in various departments. He served in the Royal Artillery during the war. On his return to the company he was made assistant works manager and in 1954 was appointed to the position of manager of the lighting division. Mr. Atherton is the younger son of Mr. T. Atherton, chairman of the Dorman Smith group of electrical companies.

Mr. E. Atherton

The North Western Branch of the **Electrical Trades' Commercial Travellers' Association** held its annual meeting at the Waggon and Horses Hotel, Manchester, on 11th November, when the following officers were elected:—Chairman, Mr. W. W. Blears; vice-chairman, Mr. G. P. Humphrey; secretary, Mr. H. Chadwick; treasurer, Mr. F. Foulkes; charity steward, Mr. F. Sullivan. Tributes were paid to Mr. J. B. Jones, the retiring chairman, to Mr. W. Smith for his work as secretary of the Branch since its formation, and to Mr. K. Snelson, the social secretary. It was decided to donate £25 to the E.I.B.A., and a collection made at the meeting realised £3 3s.

A group at the annual luncheon of the North Western Branch of the Electrical Trades Commercial Travellers' Association at the Café Royal, Manchester. Left to right: Messrs. W. W. Blears (vice-chairman), D. St. Clair Barrie (Manweb), J. B. Jones (chairman), W. Smith (secretary), and R. H. Corlett (past-chairman).

Dr. A. B. McIntosh, who writes elsewhere in this issue on "Materials for Nuclear Reactors," was educated at Allan Glen's High School of Science and the Royal College of Science and Technology, University of Glasgow. Following a period as lecturer on metallurgy at Glasgow he was, at the outbreak of war, seconded to the Chief Superintendent, Armament Research, and then to the Royal Ordnance Factories for the duration of the war. In the immediate post-war years Dr. McIntosh's responsibilities were increased so that jointly he was metallurgical adviser to the Director General of Ordance Factories and to the Deputy Controller of Atomic Energy (Production). In 1947 he relinquished his responsibilities in the Royal Ordnance Factories to give all his time to atomic energy as Assistant Director, Metallurgical Development. Since the expansion in 1950 of the metallurgical activities he has been at Culcheth in charge of the Research and Development Branch laboratories.

Dr. A. B. McIntosh

The annual dinner and dance of the **Association of Electrical Machinery Trades** is always a popular event and about 200 members and guests with their ladies attended last Friday's function at the Savoy Hotel, London, under the genial chairmanship of Mr. H. Vernon, who was accompanied by Mrs. Vernon. The only toast of the evening was to the guests, which was proposed by the chairman, who in a brief but lively speech, welcomed the presence of representatives of kindred associations and referred with particular pleasure to the presence of Mr. L. C. Penwill, director of the Electrical Contractors' Association.

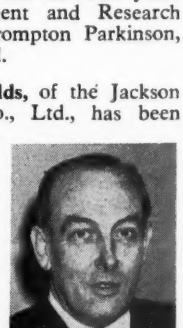
Replying to the toast, Mr. Penwill said that the A.E.M.T. was an organisation of quality rather than quantity and he referred to its usefulness in the field in which it specialised. Its member firms gave adequate service to the public and he commended it for its fair trading principles. He spoke of the value of the Association's work on various B.S.I. panels and said that under its apprentice training scheme the supply of manpower in its particular field was assured.

As is customary, Mr. J. T. Morgan, secretary, was called upon to speak and he carried out this duty in his own inimitable manner. Following the speeches the remainder of the evening was given over to dancing, during which there was an excellent cabaret.

Mr. E. M. Briscoe, B.Sc.(Eng.), A.M.I.Mech.E., A.M.I.E.E., has taken up an appointment with Mawson Taylor, Ltd., manufacturers of electrical insulation, as director of technical development. After graduating at University College, Mr. Briscoe received his practical training with A. Reyrolle & Co., Ltd., subsequently joining the staff of the British Electrical and Allied Industries Research Association as a research engineer. Before taking up his present appointment, Mr. Briscoe held a senior position for some years in the Development and Research Department of Crompton Parkinson, Ltd., at Chelmsford.

Mr. E. M. Briscoe

Mr. K. H. Foulds, of the Jackson Electric Stove Co., Ltd., has been appointed sales promotion manager. Mr. Foulds joined the company in 1946 and subsequently became publicity manager. Until his new appointment he was area sales manager and publicity manager, based in London.



Mr. K. H. Foulds

Mr. J. W. G. Bird, O.B.E., D.L., A.M.I.E.E., chief engineer of the South Wales Electricity Board since April, 1948, is retiring on 31st December after more than forty-six years' service in the electricity supply industry. **Mr. J. S. Lombard,** B.Sc.(Eng.), A.M.I.E.E., who has been deputy to the chief engineer since vesting date, has been appointed to succeed Mr. Bird. He will take up his new duties on 1st January.

To celebrate the 25th anniversary of **Aerialite, Ltd.,** a presentation has been

made to the board of directors. All employees of the group of Aerialite companies subscribed to a number of gifts which have been presented to the chairman and his co-directors by three of the employees of the company with the longest service.

The annual dinner of the Huddersfield Branch of the **Electrical Contractors' Association** was held at Whiteley's Café, Huddersfield, recently. Mr. E. Sheard, a Huddersfield solicitor, proposed the toast to the Association and Mr. J. T. Thornton, chairman of the Northern Counties Section Board of the E.C.A., in reply, said that all electrical work should be left to the experts; we could not afford to have accidents. The electrical contractor was very much against those people who tried to "do it themselves." Most accidents in the home came as a result of people connecting up things which should never be connected. Mr. W. Robinson (chairman of the Huddersfield Branch) proposed a toast to the guests and Councillor F. Durn (chairman of the Colne Valley Council) responded.

OBITUARY

Mr. Alfred Dennis Ayres, executive director of William Steward & Co., Ltd., died suddenly on 10th November. Mr. Ayres joined the company in 1937 and was appointed executive director last year. He had taken a leading part in the commercial management of the company.

Mr. Strauss and the London Board

WHEN the London Electricity Board threatened to commence proceedings for libel against Mr. G. R. Strauss, M.P. for Vauxhall, for statements to a Minister in which he criticised what he called the Board's "scandalous" method of disposing of scrap metal, it was "acting in breach of Parliamentary Privilege." This is the main conclusion of the Committee of Privileges which met on twelve occasions to consider the complaint made to the House of Commons by Mr. Strauss on 8th April [its report is published by H.M. Stationery Office, price 4s 6d].

However, the Committee had some doubt about the interpretation of the Acts of Parliament governing privilege and recommends that the opinion of the Judicial Committee of the Privy Council should be sought on whether it would be acting contrary to the Parliamentary Privilege Act, 1770, if the House treated the issue of a writ against an M.P. in respect of a speech or letter written by him to a Minister as a breach of privilege.

Request for Investigation

The report reveals that on 8th February Mr. Strauss wrote to the Paymaster General, Mr. Maudling, asking him to investigate the method by which the Board sold its scrap metal. He wrote: "It is considered a scandal in the sense that the particular industrial practice complained of must lose the Board and, of course, the public, substantial sums which may amount to tens of thousands of pounds a year and puts the non-ferrous scrap industry into an impossible situation. None of the other Electricity Boards acts in this way. Inevitably strong suspicion has been engendered throughout the trade by the behaviour of the Board...." Mr. Strauss declared that he had an indirect personal financial interest because his firm had a subsidiary firm of non-ferrous metal merchants.

In a memorandum he pointed out that the value of scrap cable could vary (according to quality and copper and lead content) from under £20 a ton to over £160. The London Board invited tenders for its arisings of scrap metal over the ensuing twelve months, and it was unreasonable and unfair that firms should not be able to ascertain in what proportion the various types of cable would arise in the period. "Any tenderer quoting for this material on the terms required by the Board does so of necessity as a pure gamble and he must, therefore, quote a low price to cover the risk and the L.E.B. (that is the taxpayer) cannot obtain a fair value for the goods," he wrote. "The L.E.B. is the only electricity undertaking that invites tenders on this basis. The normal method is to accumulate a tonnage of scrap cable and then invite offers by tender. The tenderer then has the opportunity of inspecting the actual material for which he is quoting and can form a very close estimate of the true value of the goods."

The account by Mr. D. B. Irving, chairman of the Board, of a meeting which he subsequently had with Mr. Strauss and two representatives of the Scrap Metal Merchants' Association, shows that he explained why the London Board's method of disposing of scrap differed from that of other Boards which had mainly overhead line systems and a relatively small amount of underground cable to replace. Because London had an underground system (much of which was non-standard) the recovery of scrap cable was an almost continuous process and its constant and speedy disposal was a matter of administrative and physical necessity.

A process of accumulating parcels of from 10 to 50 tons of cable, with a system of almost continuous inspection and tendering throughout the year, would involve increased transport and administrative costs and there was no proof that higher prices would be obtained. The suggestion that the matter should be put to the test by collecting a large quantity of scrap at one of the London depots and inviting tenders independently of the annual contract, would have no value, Mr. Irving explained. A trial over a longer period would be necessary. The method recommended by Mr. Strauss and his colleagues had been used from vesting day until 1952. "The present method was then introduced because of the advantages which it offered and we have seen no reason to regret its adoption," he wrote. "Indeed, the consideration which has been given to your suggestion since you were here on 18th February has served to strengthen our view that our present procedure is in the best interests of the Board and the London public."

Reflections on Personnel

"The Board considered," said Mr. Irving, "that your unsubstantiated statements, which cast grave reflections on the integrity of the Board's personnel and on the Board's attitude towards its public duty, are completely unjustified." He asked for their unqualified withdrawal. Mr. Strauss wrote disagreeing with Mr. Irving's account of the discussion and alleging that an officer of the Board had said that a test of the recommended system of sale could be carried out. He declined to make a withdrawal.

Later the Board's solicitors wrote that if there was no apology proceedings for libel would be instituted, whereupon Mr. Strauss's solicitors replied that Mr. Strauss "is quite satisfied that the practice of which he complained was and is in no way attributable to any improper conduct on the part of the Board or any of its officials." He was in his letter expressing the views of the trade as put to him and not his individual view about a matter of which he had little personal knowledge. He considered it his duty to put these matters before the Minister responsible, and "is happy to have been afforded the opportunity of satisfying himself that the practice in question is the result of obstinacy and folly and of nothing more."

The Board's solicitors then replied: "We observe that your client, though he has refused two previous invitations to do so, appears now to be withdrawing the imputation of dishonesty but without expressing one word of regret for having made it. In this respect, as in others, your letter is wholly unsatisfactory and we are instituting proceedings which we expect to serve upon you during the course of next week." The letter was dated 4th April. At this point Mr. Strauss raised the matter in the House.

Diesel-Electric Locomotive

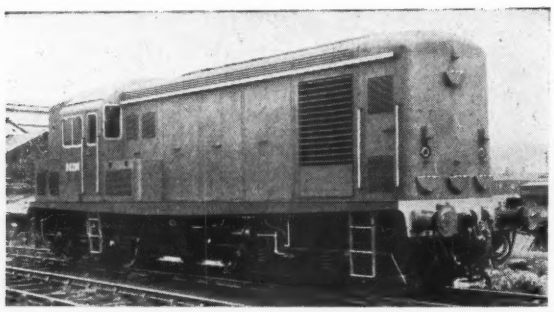
ON Monday last the first of ten 800 h.p. Bo-Bo diesel-electric locomotives for main line freight duty were formally handed over by Lord Chandos, chairman of the British Thomson-Houston Co., to Lord Rusholme, chairman of British Railways London Midland Region Area Board, at Euston Station, London.

The locomotive is rated at 800 h.p. and is to be used primarily for main line freight duty. It has a maximum designed effort of 60 m.p.h. and a maximum tractive effort of 37,500 lb at starting and is capable of exerting a continuous tractive effort of 20,000 lb at 10·5 m.p.h. The locomotive has been designed to the general requirements of the British Transport Commission under the overall direction of Messrs. R. C. Bond and S. B. Warder (respectively general mechanical engineer and general electrical engineer, British Railways Central Staff, B.T.C.). Mr. J. F. Harrison (chief mechanical and electrical engineer, L.M.R., Derby) has been responsible for liaison with the contractors and for inspection during construction and preliminary testing. Mr. John Barnes, F.S.I.A., of Allen-Bowden, Ltd., Leamington Spa, has acted as design consultant on behalf of the B.T.C. design panel.

The B.T.H. Co., Ltd., in addition to acting as main contractor for the whole locomotive, provided all the electrical equipment and carried out the erection and wiring of the equipment in the locomotive and subsequent testing. The mechanical structure was designed by Clayton Equipment Co., Ltd., in collaboration with B.T.H.; this company also built the bogies and the superstructure of the locomotive. The underframe was built by the Yorkshire Engine Co., Ltd., and the final assembly and painting of the complete locomotive was carried out by the same company.

The locomotive is of generally conventional design, two four-wheeled swing bolster bogies being used, fitted with SKF roller bearing axleboxes. There is a nose-suspended traction motor mounted on each axle, driving through single reduction gearing with a resilient gearwheel. The body comprises a power unit and radiator compartment, a driver's cab, and a short rear compartment housing the control equipment and certain auxiliaries.

The power equipment consists of a Davey Paxman 16-cylinder YHXL 7in-bore × 7·75in-stroke vee type diesel engine rated at 800 b.h.p. at 1,250 r.p.m., coupled to a B.T.H. six-pole, 500 kW generator rated at 690/337 V, 720/1,320 A. The engine-generator set is resiliently mounted at four points on the two I-girder longitudinals which form the principal members of the underframe. The auxiliary generator is an 8-pole machine rated at 40 kW, 110 V, 625/1,250 r.p.m., the armature being carried on an extension of the main generator shaft. The exciter is mounted on an adjustable platform on top of the auxiliary generator frame, and is belt driven from the main generator shaft.



The B.T.H. (British Railways Type I) diesel-electric locomotive

The main control gear is located in the short compartment behind the driver's cab, which has two driving positions, diagonally situated, at each of which a swivelling seat is provided. To the right of each position is a freestanding master controller, incorporating essential indicators, and to the left are the air and vacuum brake controls. The less important instruments and alarms are mounted on the cab bulkheads.

The locomotive is fitted with compressed-air brakes, and with vacuum exhausters and control equipment for application of vacuum train brakes. It is arranged for operation in multiple with certain locomotives of similar or of greater rating in groups of up to three locomotives.

Public Transport Association

THE need for greater efficiency in transporting merchandise and for carrying it more cheaply were emphasised by Mr. H. Watkinson, Minister of Transport, in proposing the toast of the Public Transport Association at its annual dinner held last week in London. Mr. Watkinson said that unless the constant inflation of transport costs, as of national costs, was stopped, then it would destroy all that the Government was hoping to do to provide the country with a modern, streamlined service. Referring to railway modernisation, he said that one of the main purposes of the plan was to make the railwayman's job once again one of the key jobs in industry. But it could only be so if the full resources available were deployed—electronic signalling systems, the replacement of steam by diesel and electric traction, and the modernisation of freight handling. It was on these things and on the increasing efficiency that they would bring, that the railwayman must rely for his future security and prosperity.

Mr. T. R. Williams (chairman of the Association), in replying to the toast, referred to the fuel duty and the heavy excise tax related to seating capacity of public service vehicles as an anachronism similar to the old window tax. Unlike industry generally, which was not fettered in its ability to extend its productive capacity to take care of increased costs, the road passenger transport industry was fettered by existing statutory and other provisions, especially those relating to the speed, size and routing of vehicles. The industry had an enviable record of public service, and deserved a "break" both from the Government and the public. A revision of the existing limit in the length of 30ft, particularly in relation to single-deck vehicles, would be an advantage in increasing productivity and the ability to reduce costs.

Mr. Williams also proposed the toast to the guests and Sir John Elliot (chairman, London Transport Executive) replied in a witty speech.

New Research Station

THE Research Council of the Department of Scientific and Industrial Research has decided to replace the present Fuel Research Station at Greenwich by a new research station at Stevenage.

The work of the new station will not be confined to the field of fuel research but will include any other selected investigations requiring staff and facilities, including intermediate scale facilities, of the kind necessarily to be provided for fuel research. An example of this new sort of work is provided by mineral processing research. Such research is made necessary by the increasing demand for metals and a diminishing supply of rich ores, with a consequent need to examine new methods for the treatment of low grade complex ores; and the growing demand for some of the less common metals for such developments as those of atomic energy and the jet engine. The Department intends to establish a division within the new station at Stevenage to undertake any work not otherwise provided for but which is considered to be nationally desirable and economically justifiable.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Capping of Fluorescent Tubes

HAVING read Mr. C. J. Bennett's letter on the above subject I feel that he has raised an important point in view of the present tendency of manufacturers towards standardisation of the two-pin cap for fluorescent lamps. This cap is much more easily damaged when inserting lamps than I think the manufacturers imagine.

Speaking as a repairer of burnt-out fluorescent tubes, my experience is that around 15 per cent of the two-pin capped tubes received at our works for reconditioning have been rendered unusable by reason of damaged cap pins only. This compares with a figure of less than 1 per cent for the bayonet cap. As my firm make a fixed charge for lamp reconditioning it is, of course, to our advantage to receive lamps which require the fitting of perhaps one cap only, but we feel that users are often extremely annoyed at having to send lamps for repair before they have had the use of them.

If standardisation is contemplated I would agree that Mr. Bennett's suggestion to use bayonet caps is the only practical solution. The simplicity and robustness of the bayonet cap far outweighs the small increase in luminance per fitting length plus a little added neatness which is obtainable with the shorter two-pin arrangement.

Middlesbrough. R. E. JEFFERSON,
(E. J. Dawes, Ltd.).

I HAVE read with interest Mr. C. J. Bennett's letter to you in your issue of 8th November in which he questions the wisdom of using bi-pin caps for 5ft tubes and rather suggests that, on the contrary, all the tubes should have bayonet caps.

It is, of course, well known that the bayonet cap was originally adopted at the outbreak of the war as this was the only one available, and it is equally clear that it has many disadvantages from the point of view of operation and maintenance. On the other hand, the bi-pin cap makes it possible to have continuous runs without gaps and if suitable lampholders are employed—such as the spring-loaded type used in the Atlas "Atlantic" range—the tube is entirely safe and extremely easily replaced.

London, W.C.2. H. H. BALLIN,
Director, Technical Sales Manager,
Atlas Lighting, Ltd.

Flat Rate for Electricity

AS the author of the article to which Mr. G. H. Currie refers in your issue of 15th November, may I offer a few comments on his letter?

Mr. Currie is mistaken in interpreting the method he cites as aiming at charging an individual consumer "as if the undertaking were supplying him alone." On the contrary, the method is based on the fact that the group load factor of industrial low-load-factor consumers is much higher than their individual load factors. He is also mistaken in referring to system load factors "of the order of 70 per cent." Unfortunately, they are as yet only of the order of 45 per cent.

Time and again it has been stressed that in contrast to manufacturing industries, where the cost of a mass-produced article is directly related to quantity, the electricity supply industry always sells two products, kW and kWh, although for practical reasons it does not always charge for them separately. Flat rates can equitably recover the cost of supply only if confined to types of consumer with an inherently similar load factor (as related to "potential peak periods"). But while "consumer" costs can be collected by means of fixed blocks, with domestic consumers, for instance, another variable factor enters in the form of increasing costs of mains as the distance between dwellings grows; in urban and suburban areas this distance is to some degree related to the size of dwelling.

London, E.C.2. P. SCHILLER.

New Design of Cooling Tower

I WAS interested to read the article you published under the above heading in your issue dated 8th November. The statement that mechanical draught towers are replacing hyperbolic natural draught towers is, in my opinion, entirely incorrect.

Every major electricity generating station in this country that requires cooling towers is provided with natural draught ones as the Central Electricity Authority appears, as the result of careful assessment, to be satisfied that they are more economical than mechanical draught ones. The designs for these major generating stations have to be passed by the Royal Fine Art Commission.

I believe that all the designers of natural draught towers also design mechanical draught towers, and it has not come to my notice that any of these designers are of the opinion expressed in your article. In the United States, which at the present time uses almost exclusively mechanical draught towers, a great and increasing interest in natural draught cooling towers has arisen. It may be that in America the exact opposite of the statement made in the article will come about, namely, that natural draught cooling towers may supersede the mechanical draught tower.

Buckhurst Hill, Essex. P. STALLEY.

[The actual wording used in our article was as follows:—"These towers, which are widely used in the United States, are replacing the more conventional hyperbolic or 'milk can' shaped natural draught towers seen in this country. . . ." Editors, *Electrical Review*.]

High Voltage Testing Lectures

A COURSE of eight lectures on "Techniques of High Voltage Testing" will be held in the Manchester College of Science and Technology on Thursdays, commencing on 16th January next.

The organising lecturer will be Mr. F. S. Edwards, M.Sc., M.I.E.E. (Metropolitan-Vickers Electrical Co., Ltd.), and associated lecturers will be Messrs. W. P. Baker, B.Sc.(Eng.), A.M.I.E.E., D. J. Evans, M.A., F. W. Gee, B.Sc.Tech., A.M.I.E.E., P. R. Howard, Ph.D., B.Sc.(Eng.), M.I.E.E., and A. S. Husbands, B.Sc.(Eng.), M.I.E.E.

The fee for the course is £1 10s and applications should be sent to the Registrar of the College, Saville Street, Manchester, 1.

INDUSTRIAL NEWS

Import Tariff Simplification

The Government is now seeking authority for the introduction of a Bill into the House of Commons empowering the Treasury to impose import duties, by order made on the recommendation of the Board of Trade, for the purpose of giving tariff protection to goods produced in the United Kingdom, of giving preference to goods which qualify for Commonwealth preference, or of imposing retaliatory duties against the goods of any country which discriminates against goods of the United Kingdom or of the Colonies. This legislation will simplify and bring up to date the structure of the tariff. Its object is not to change present rates of duty, though it will contain powers for changing such rates in future.

An important purpose of the Bill will be to enable the Treasury to introduce a new tariff based on the Brussels Nomenclature. The Bill will repeal all the existing legislation relating to the protective tariff and replace it by a single comprehensive measure.

It is intended to provide for replacing the existing arrangements for dealing with applications for changes in duty by machinery adapted to present conditions. The Bill will provide for a statutory body, to be known as the Import Duties Board, which may be required to assist the Board of Trade by investigating and reporting on the facts relating to applications to change import duties. The Import Duties Board will have power to recommend relief from duty by way of drawback and relief from duty on individual consignments of goods in special circumstances.

United States World Trade Fair

The Board of Trade is to take part in the second United States World Trade Fair to be held at the New York Coliseum from 7th to 17th May next. It will stage a display covering a floor area of 2,800 sq ft along with the displays of other countries which are next year being sited on the second floor of the building.

The Commercial Department of the British Consulate-General in New York has provisionally reserved a total of 6,600 sq ft in five of the seven trade sections for British firms that would like to exhibit. Unless, however, such space is taken up before 15th December the Fair authorities intend to make it available to exhibitors from other countries. United Kingdom firms wishing to take part are therefore advised to make a provisional reservation immediately with the promoters' London representative, Mr. A. P. Wales, British and Commonwealth Office of the Charles Snitow Organisation, Dudley House, 36-38, Southampton Street, London, W.C.2 (Tem. 8947). The groups in which space has been reserved include radio, machine and precision tools, and scientific instruments.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £197 0s 0d
COPPER, H.C. Electro	ton £187 15s 0d
Fire Refined 99·70%	ton £186 0s 0d
Fire Refined 99·50%	ton £185 0s 0d
COPPER Tubes ..	lb 1s 10½d
Sheet	ton £218 0s 0d
H.C. wire and strip ..	ton £241 5s 0d
LEAD, English ..	ton £83 10s 0d
Foreign	ton £82 0s 0d
MERCURY	flask £69 0s 0d
TIN, block (English) ..	ton £730 5s 0d
ZINC, G.O.B. Foreign	ton £67 10s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 1s 6½d
Sheet	ton —
Wire	lb 2s 4d
PHOSPHOR BRONZE Wire	lb 3s 7½d
PLATINUM	oz £31 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 23½d—23¾d

Dorman & Smith Sales Conference

Dorman & Smith, Ltd., and D.S. Plugs, Ltd., held their annual sales conference at the group's head office in Manchester during the week ended 26th October. The entire sales force attended the meeting and were addressed by the chairman, Mr. T. A. Atherton, and by the heads of the various manufacturing divisions who announced new developments and additions to the range of products already manufactured by the two concerns.

Tin Plate Workers' Travelling Scholarships

The Court of the Worshipful Company of Tin Plate Workers has again decided to offer up to twelve travelling scholarships, each to the value of £50, on the same terms and conditions as last year.

Bathroom Fatality

A verdict of "Accidental death" was recorded by the Stockton-on-Tees deputy coroner (Mr. F. W. B. Pacey) recently on an eight-year-old boy found dead in the bath at his home. The boy's mother said that because there was no lamp in the bathroom ceiling fitting she told him to take a bedside lamp from her room. Mr. K. McLean, assistant commercial engineer, North Eastern Electricity Board, said that the boy had been electrocuted when he touched the lamp as he was in the bath. The lamp had a faulty flex where it touched the metal base, but it had been used for five years in the wooden-floored bedroom without mishap.

Gauge and Tool Makers' Guide

The Gauge and Tool Makers' Association has issued the seventh edition of its Members' Handbook, which includes a comprehensive buyers' guide index to the products of its 350 member-companies. Copies are available to buyers of tools and gauges, free of charge. The address of the Association is Standbrook House, Old Bond Street, London, W.1.

Scientific Instrument Research

A series of six open days was held recently by the British Scientific Instrument Research Association. Over 750 people attended, representing member firms, other scientific instrument manufacturers and large users of instruments, etc. Of the 77 exhibits two experimental flowmeters, one electromagnetic, the other ultrasonic, attracted a great deal of interest. Both instruments are in course of development by the Association and in time should be taken over by one or several member firms for manufacture and marketing.

Other exhibits which aroused particular interest included a hygrometer for the range 0-1 per cent R.H., a new type of chemical balance using flexure pivots in place of knife edges, two new types of drift-corrected d.c. amplifiers and a new process developed by the Association for producing permanent markings in thermometer graduations. In the Optical Department visitors were able to see the part played by electronic digital computers in the development by the Association of an improved microscope objective, and the examination of light transmission through thin filaments with special reference to fibrescopes. In the Mechanical Department techniques for the high speed grinding of glass were demonstrated.

Television in Ireland

It is planned to start a television service in Ireland. The Minister for Posts and Telegraphs (Mr. Neal Blaney), announcing this at a meeting of the Irish Association of Advertisers in Dublin, indicated that it would be a commercial service and applications would be invited from anyone interested in the project. A Television Authority would be set up, and there would be a condition that a certain proportion of the programmes should be in the Irish language. The

Minister said that he had already received a number of applications from interested parties, including Pye (Ireland), Ltd., and the Glendon Television Corporation of America.

Condenser Tubes for Berkeley

The Yorkshire Copper Works, Ltd., has received an order from the Metropolitan-Vickers Electrical Co., Ltd., for 215 tons of "Yorcoron" main condenser tubes for the new atomic power station at Berkeley, Glos.

Radio Trades Examination Board

The annual report of the Radio Trades Examination Board for the year ended 31st August last analyses the examination results. It states that from only six colleges which before the war held courses in radio servicing, there are now in Great Britain sixty-five such colleges providing instruction specifically for the Board's radio servicing certificate examination. Thirty of these schools are also running courses for the television servicing certificate examination. A conference of local examiners was held in April last, the success of which has led to the Board arranging for similar conferences to be held annually. A licence was acquired from the L.C.C. during the year to operate an appointments bureau.

U.H.F. Transmissions

A series of test transmissions on 654·25 Mc/s is now being carried out by the B.B.C. to collect propagation data relating to the u.h.f. bands (Bands IV and V) which were allocated to television at the International Radio Conference at Atlantic City in 1947, but are not so far used for this purpose. Initially tests will be carried out on 405 lines and later on 625 lines. It is stressed that there is no intention of making any change in the 405-line standard used for television in Band I.

Films and Automation

At Plymouth on 8th November the Scientific Film Association organised for Tecalemit, Ltd., a meeting on "Films and Automation" which was attended by over 320 representatives from industry and education in the south west. The chairman was Mr. T. R. Hardman, general manager of Tecalemit, Ltd., and the subject was introduced by Mr. R. J. Cowie, of the Production Engineering Research Association, who outlined the main technical developments in the field of automation and discussed some of their social implications. He illustrated his talk with three films.

Works Visit

Representatives of the Syndicat National de la Construction Electro-thermique et Electro-domestique, who have been in this country discussing common interests and problems, including the introduction of the European Common Market, with members of the domestic electric appliance sections of the British Electrical and Allied Manufacturers' Association, visited the Rheostatic Co.'s Frimley Works recently and were shown some of the processes in the manufacture of thermostats for domestic appliances. They were accompanied by representatives of the B.E.A.M.A., who afterwards entertained them at lunch.

Equal Pay

Women welders are being recruited to work at the Walker-on-Tyne Shipyard of Vickers-Armstrongs (Shipbuilders), Ltd. They are being paid the same rates as men. The firm has taken this step, with the approval of the trade unions, to overcome the shortage of welders.

Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 15th November is deemed to be 186s 6d.

The "costs of materials" figures are: For electrical machinery and equipment the Board of Trade index figure published on 15th November is 179·4. For turbo-generating and allied plant: Materials used in mechanical engineering industries 187·0, blast furnaces and iron and steel melting and rolling (40 and 41) 192·3. The price of ¾in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 15th November) is 42¾d per lb.

F.B.I. Register

Sir Hugh Beaver, President of the Federation of British Industries, in a foreword to the 1958 edition of the "F.B.I. Register of British Manufacturers," says that its object is to spread the widest possible knowledge of the great range of British manufactured goods. The Register lists the products and services of over 7,500 member firms under more than 5,400 alphabetical headings. In addition to the classified buyers' guide there are seven other sections, giving addresses of companies and firms, and information about trade associations, proprietary names, trade marks, etc. Glossaries in French, German and Spanish give translations of every product term used in the main buyers' guide. The Register is published for the Federation of British Industries by Kelly's Directories, Ltd., and Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1, price 42s, post free.

Troughton & Young Lighting Centre

Over the past few weeks the lighting centre at Knightsbridge of Troughton & Young (Lighting), Ltd., has undergone a complete transformation. One of the failings of lighting showrooms in the past has been the difficulty of showing a large number of fittings without an appearance of overcrowding. This difficulty has been overcome by the design by Mr. Hulme Chadwick, A.R.C.A., F.S.I.A., A.R.Ae.S. The ceiling consists of a number of panels, sloping, horizontal and vertical, breaking up the ceiling into various levels. Pendant fittings are thus shown to advantage from one end of the showroom, sufficiently spaced to be able to be seen independently, whilst from the other end of the showroom it is possible to see ceiling fittings set on the lower part of the ceiling and recessed fittings set on the slope. Wall brackets and standard lamps are also arranged in such a way that they can be seen independently, being backed by varying materials to show off the fittings to the best advantage. All fittings throughout the showroom are separately switched, so that individual fittings can be seen in isolation. The problem of disposing of the large number of switches involved, has been overcome by careful consideration of what is known as "logical" switching. This means that the switches are placed on the panels in a layout similar to that of the fittings. Pendant fittings, for example, are placed on one panel in rows, simulating the rows on the ceiling. This does away with the need for diagrams and coding.

In accordance with current practice, displays are also arranged of lighting, as opposed to lighting fittings. A formed ceiling showing the effects of

Part of the display at the Lighting Centre of Troughton & Young (Lighting), Ltd.

cold cathode lighting in cornices is shown in one section with part of the ceiling cut away to show the tubes. A fluorescent inset panel not only shows the effects of different types of fluorescent lamps but also different types of finish. A number of specially designed fittings using different finishes for such arrangements as cornice lighting, decorative panels, etc., are shown.

The opening of the showroom last Tuesday coincides with the 50th anniversary of the parent company, Troughton & Young, Ltd., which started in Knightsbridge in 1907. The Lighting Company was founded thirty years ago.

Electrical Equipment Design

The November issue of *Design* (3s from the Council of Industrial Design, 28, Haymarket, London, S.W.1) includes a profusely illustrated article by Peter E. M. Sharp, B.Sc.(Eng.), A.M.I.E.E., on " Switches, Plugs and Sockets " which deals in an interesting way with domestic electrical installation accessories. It demonstrates by means of contrasting pictures the progress made æsthetically as well as technically in these accessories. In other articles in this issue L. Bruce Archer deals with the " appearance " design of electronic instruments, and John Gray with " Style and Technique for Telephones."

Self Induced Spray Type Collector

A new range of self induced spray type wet dedusters, specified series MG, available in 13 standard sizes ranging from 2,000 c.f.m. to 48,000 c.f.m. capacity, has recently been introduced by Dallow Lambert & Co., Ltd., Thurmaston, Leicester. The deduster is available for four principal methods of sludge removal, being extremely adaptable in this respect.

No pumps, nozzles, high speed rollers or other mechanical spray producing equipment are employed, so avoiding wear and choking normally associated with such equipment when dealing with sludge or slurries. Automatic controls ensure optimum operating efficiency under all conditions and reduce water consumption to a minimum.

Advanced Purchasing Course

The Purchasing Officers' Association is holding an advanced purchasing course from 14th to 19th April next at Christ Church, Oxford. It will be conducted by Dr. Howard T. Lewis, A.M., LL.D., Professor of Marketing, Emeritus, Graduate School of Business Administration, Harvard University. The attendance will be limited to one hundred people engaged in purchasing for industrial and public undertakings, of chief buyer or, in the case of large organisations, deputy chief buyer status. The fee is £25 inclusive of accommodation and meals, and applications should reach the Association, Wardrobe Court, 146a, Queen Victoria Street, London, E.C.4, by 31st December.

British Reactor Building for Germany

Whessoe, Ltd., Darlington, announce that they are providing designs for the sealed building to contain a research reactor for the Federal Government of Western Germany. This building will be as constructed by Whessoe for the DIDO research reactor, Harwell, and similar to that built by the company for the PLUTO reactor. These sealed buildings, both 70ft in diameter and 67ft high, are constructed entirely of steel.

Aluminium in Packaging

The Aluminium Development Association has issued a brochure (No. 11) entitled " Aluminium in Packaging." This is intended for designers and industrial users of packages and deals with expendable aluminium containers, packages and similar products made from thin gauge materials. Following a brief account of the place that aluminium has acquired in the packaging field, the types of containers and packages are described, the composition and properties of materials are outlined and the forms in which aluminium is available for this purpose are given. The brochure is fully illustrated, many of the illustrations being in colour. Copies are available from the Association, 33, Grosvenor Street, London, W.1, price 10s 6d.

Dallow Lambert wet deduster foundry installation handling 96,000 c.f.m.

Fuel and Power Statistics

The " Ministry of Power Statistical Digest, 1956 " is now available from H.M. Stationery Office (price £1 17s 6d). It contains, as usual, exhaustive details of coal and other mineral production and solid fuel distribution, gas and electricity production, particulars of coke ovens, and statistics relating to benzol, coal tar and petroleum. Other sections contain statistics of accidents and industrial diseases in the mining industry. The principal figures relating to electricity generation and distribution during the period have already been published in the *Electrical Review* but the volume will be useful to those who wish to make a more detailed study of the industry.

Diesel Sets for North Africa

Virgilio Cancellieri, of Tripoli, has placed an order with J. & H. McLaren, Ltd., of Leeds, for two hundred BRABO generating sets. The sets, 100 of which are 3 kW generating sets powered by Petter AVA1 air-cooled diesel engines, while the rest are 6 kW sets powered by Petter AVA2 engines, are all coupled to Brush self-regulating " Square Path " alternators. They are of the hand start remote stop type and will mainly be used to power electrically-driven well pumping plant for such purposes as irrigation systems and drinking water supplies. An additional order from the same customer for 50 type DH horizontal oil engines each developing 20 b.h.p. at 1,000 r.p.m. has also been received.

Beryllium Copper Stockpile

The Board of Trade announces that it intends to dispose of 37 tons of beryllium copper master alloy with a beryllium content of about 4 per cent. This material is being offered for sale by open tender for delivery in December and January. Forms of tender are obtainable from the Board of Trade, G.7, Lacon House, Theobalds Road, London, W.C.1.

Colour TV for Medical Use

For some years past the medical profession, and teaching hospitals in particular, have been interested in the possibilities of closed circuit television as a medium for demonstrating surgical and clinical techniques. Marconi's Wireless Telegraph Co.,

Ltd., has been actively concerned with the development of colour television for many years, and engineered the first compatible colour TV system to be seen in Britain, and supplied the cameras and transmitters which the B.B.C. are using in their experimental colour broadcasts. As a result, a practical medical colour TV system has been evolved.

Smith Kline & French Laboratories, the American pharmaceutical concern, has placed an order with Marconi's for the supply and operation of a mobile colour television unit, which will be placed at the free disposal of medical authorities for use at professional meetings of all types throughout Britain.

The unit will embody the latest types of Marconi colour equipment including a 3-tube Image Orthicon colour camera channel, "colourplexer," pulse and waveform generating equipment, vision mixing equipment, vision distribution equipment and sound equipment; black-and-white camera channels will also be incorporated for televising the panel of doctors who normally comment on proceedings from a separate studio at intervals during the telecast. A 405-line system to anglicised NTSC standards will be used. Both 21in direct-viewing colour monitors and medium-screen projectors will be incorporated. The vehicle itself will have a specially-built body on an 8-ton passenger chassis and will be air-conditioned.

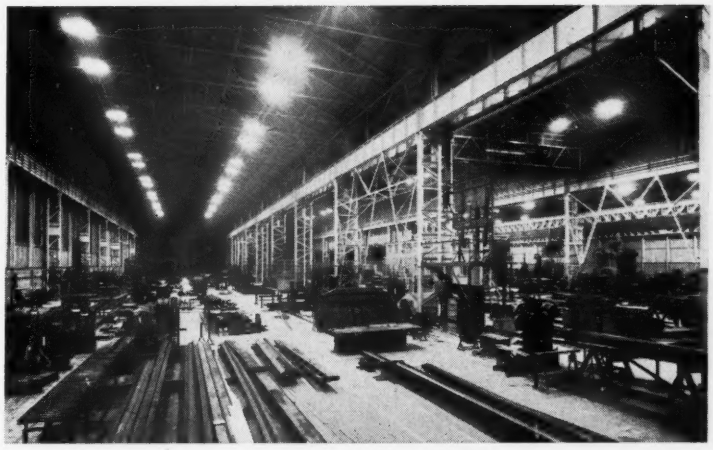
Japanese Commission at Berkeley

On 13th November representatives of the Japanese Atomic Energy Commission headed by Mr. Ichiro Ishikawa, the deputy chairman, visited the site of Berkeley nuclear power station at present being constructed by the A.E.I.-John Thompson Nuclear Energy Co., Ltd. He said that Japan was considering building a power reactor in the near future. They already had research reactors and were interested in the progress being made in Great Britain. He was impressed by the speed of operations at Berkeley and said that they would shortly be coming to England to buy one of these stations.

Works Blended Lighting Installation

The complete high bay lighting installation at the new works of Old Park Engineering, Ltd. (an offshoot of Round Oak Steel Works, Ltd., and the youngest subsidiary in the T.I. Group), which was officially opened last month at Holly Hall, Dudley, Worcs., was specially designed and supplied by the Simplex Electric Co., Ltd.

Blended light fittings were used and these have been arranged in two rows along each of three bays. Each fitting takes two lamps—one 1,000 W tungsten, the other 400 W mercury vapour. The tungsten filament lamp gives immediate light while the mercury lamp is attaining full brilliance. Mounted at a height of 43ft the fittings are spaced at approximately 26½ft intervals, giving an illumination level about 12-15 lm/ft^2.



Lighting fittings designed by the Simplex Electric Co., in the new works of Old Park Engineering, Ltd., Dudley

British Council's Report

A substantial part of the 1956-57 report of the British Council (65, Davies Street, London, W.1) consists of an article on "The Council and the Sciences." In this are set out the various activities of the Council in acquainting other countries with British scientific achievements. Mention is made of the fact that of the post-graduate scholarships awarded during the past five years to overseas students, to enable them to spend a year at a British university or other centre of higher study, 594 (or 56 per cent of the total) went to the sciences. A few Council awards are now made, in conjunction with the Federation of British Industries, to enable lecturers in engineering to spend one year at a British university and one with a British engineering firm.

In connection with the Council's scheme for providing films and recordings many eminent scientists and engineers have written scripts and made recordings without fee. Among those particularly mentioned are Sir Claude Gibb ("Steam Turbines"), Sir Christopher Hinton ("Atomic Energy") and Mr. W. K. Brasher, secretary of the I.E.E.

Switchgear Exhibition

J. A. Crabtree & Co., Ltd., is holding an exhibition of its products at "Lincoln House," 16, Lloyd Street, Manchester, 2, from 2nd to 13th December.

Work Starts at Winfrith Heath

The Turriff Construction Corporation, Ltd., has announced that work on the site of the new atomic energy research establishment on Winfrith Heath, Dorset, will start next Monday. The company are main civil engineering contractors for external works, foundations, sewage, reservoir, water-treatment and service mains on the site. The contract is valued at £1,200,000.

Trade Announcements

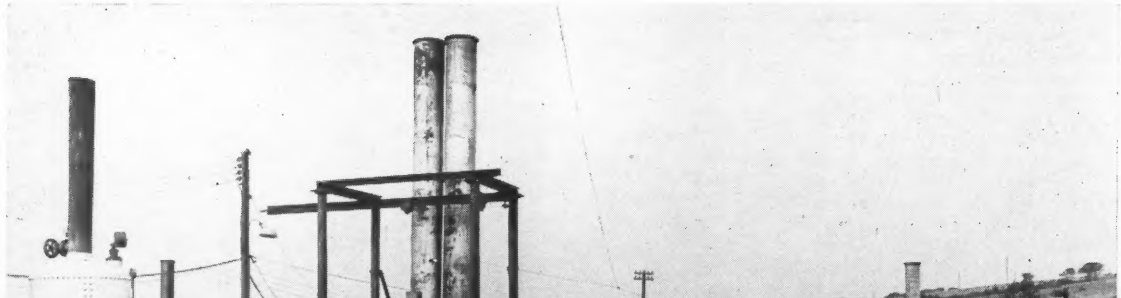
Bill Switchgear, Ltd., has appointed new agents in South Africa for the following areas:—Transvaal, Natal, Orange Free State, Bechuanaland and Basutoland: Mr. L. Safro, the Utility Sales Corporation, 21, Vanguard House, Johannesburg. Cape Province and South West Africa: Mr. R. B. Mathews, 25, South West House, Greenmarket, Square, Cape Town.

Ketay, Ltd., Romford, Essex, in conjunction with the Norden-Ketay Corporation, United States, has recently concluded a licensing agreement with the Société Anonyme Precilec of France, which provides for the manufacture under licence, and sale, of Ketay and Norden-Ketay synchro and servo-mechanisms in France, together with the interchange of technical and manufacturing information between the three companies.

The **Carter Electrical Co., Ltd.,** Eastern Avenue, Romford, Essex, has now become a subsidiary company of the **Display Motors & Accessories Co., Ltd.,** Sewtric House, Honeypot Lane, Stanmore, Middx.

The Tube Division of **Varian Associates,** California, has appointed **Livingston Laboratories, Ltd.,** Retcar Street, London, N.19, as its representative in England, Wales, Scotland, Northern Ireland and Eire.

Shaw Moisture Meters has moved to its new factory and laboratories at Rawson Road, Bradford. The head office remains at 31, Market Street, Bradford.



Single borehole trial at Newman Spinney showing gas stacks and instrument huts

Underground Gasification

PILOT SCHEME FOR 3·75 MW GENERATING PLANT

SINCE 1949 a series of investigations into the various methods of underground gasification of coal have been conducted in this country in an endeavour to devise means of making use of unmineable seams (i.e. impossible to mine economically by conventional methods) to produce electricity for general distribution. By the end of 1955 this work had resulted in the development of what appeared to be a successful and economic solution of the problem and a full description of the gasification techniques which had been evolved at Newman Spinney, near Chesterfield, was published in the *Electrical Review* of 18th November, 1955.

Earlier this year the original 23-acre experimental site at Newman Spinney was taken over from the National Coal Board by Humphreys & Glasgow, Ltd., the N.C.B. having itself taken over from the Ministry of Fuel and Power in July, 1956. Experimental work is at present concentrated on this site and new accommodation is being constructed. A further 50 acres has recently been acquired by the N.C.B. as an extension to the original site for the construction of the first five arrays of the pilot scale plant. The whole of the operations on both the old and new sites have been designated a quarry, not a mine, under the Mines and Quarries Act, and for the purposes of this Act Humphreys & Glasgow, Ltd., are the quarry owners.

Instrumentation associated with shaft No. 1

The contract awarded to the company involves the construction of a pilot scale gasification plant up to the gas inlet of the 3·75 MW generating station to be built by the Central Electricity Authority, details of which were announced some weeks ago. They will also be responsible for the further experimental and development work required and the preparation of designs for a 60 MW commercial scale gasification plant. The pilot plant, on which work has already started, is due to be producing gas by December, 1958, and when we visited Newman Spinney a few days ago we were able to see something of the considerable amount of experimental and development work which is at present being conducted so that the most up-to-date information can be used in the design of the pilot plant. To avoid restricting the gasification experiments which can be conducted at Newman Spinney the N.C.B. has provided facilities in Oxcroft Colliery nearby for experimental work on directed drilling.

The pilot plant is designed to produce enough gas to generate about 5 MW and the gas will be burned in the C.E.A.'s boiler house for the generation of electricity by a conventional steam turbine and alternator. A survey of the available coal measures at Newman Spinney was carried out earlier this year by the Opencast Executive and on the basis of this survey the position of the first five pilot plant arrays have been fixed, preliminary surface

works have been undertaken and sinking of the first shafts has commenced.

Each of the pilot plant arrays will have a concrete-lined shaft, 8ft in diameter, going down to the selected coal seam. From this shaft a gallery 100 yd long will be driven into the coal seam and from each side of this gallery boreholes 100 yd long will be drilled in the seam at 10 yd intervals. Thus there will be ten boreholes on each side of the gallery embracing an area of about 20,000 sq yd of coal seam.

Air will be conducted to the far end of each borehole by means of tubes in the borehole fed through blast mains running down the shafts and gallery from a central blowing plant adjacent to the power station. Gas will return along the boreholes and will be cooled by water spraying in the gallery and shaft, the top of the shaft being capped with a gas offtake connected by surface gas mains to the power station boiler house.

To satisfy the gas requirements of the power station two such arrays will be gasified together, each array having a life of about nine months. While two arrays are being gasified others will be in course of preparation so that they may be brought into use as previous arrays reach the end of their useful life.

The pilot plant is designed to give much experimental information and will therefore be provided with more elaborate instrumentation than would be necessary for a full-scale commercial plant. Furthermore, with a full-scale plant longer galleries and boreholes would be used and shafts would be much farther apart. With the absence of many experimental features, the disturbance to the countryside produced by a commercial plant would thus be much less than is the case with the present pilot plant.

Preliminary work has started on part of the old experimental site for the construction of the C.E.A.'s power station and Humphreys & Glasgow's machinery room, switchgear house, etc. Electricity produced from the power station will be fed into the local supply system.

The accommodation available on the site at the beginning of the year had grown as the scale of the Ministry's experimental work expanded and as various techniques were tried and discarded. With the decision to build a pilot plant and to concentrate on the development of the blind borehole system it became necessary greatly to expand the staff on the site and a new accommodation block is now under course of construction, including a laboratory and workshops.

With the blind borehole technique boreholes are drilled in the seam of coal and an air pipe is inserted along each borehole. The coal is ignited at the blind end of the boreholes and air is blown into the resulting reaction zone. Hot gases pass back along the borehole, but outside the air pipe, and in so doing transfer much of their sensible heat to the ingoing air. So far all experiments have been conducted with single boreholes, the gas being piped from the exit of these boreholes to the surface.

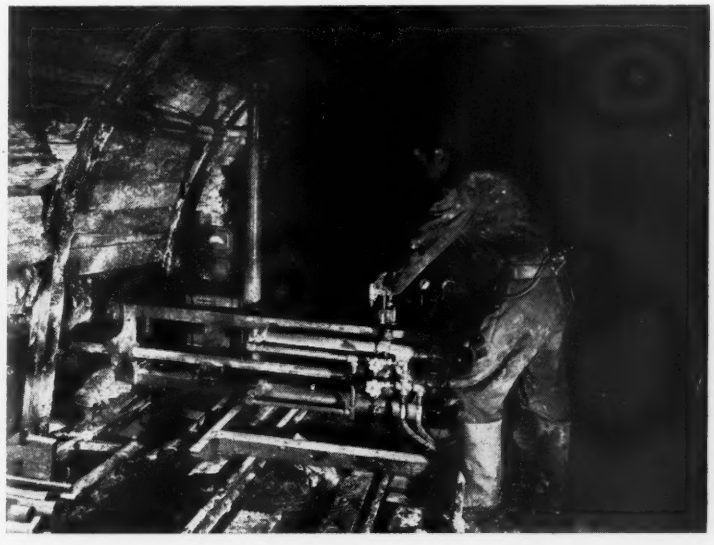
Multiple Borehole Experiment

Final preparations are now being made for the first multiple borehole experiment which has been prepared in shaft No. 3 on the experimental site. For this experiment the Sough seam is being used and four boreholes, each 250ft long by 12½in diameter, have been prepared. The air pipes to be used will be of 4in diameter made up from short lengths of high chrome cast iron with screwed couplings, and with an improved form of joint. The inbye 70ft (the tip or forward end) of each air pipe is protected by refractory piping to withstand the very high radiant temperatures to which the air pipe is exposed in the early stages of the reaction.

In the case of this experiment, and for the first time, the gallery and shaft will be used to conduct the gas, and water spraying has been arranged in the shaft and gallery to cool the gas to 35 deg C at the shaft top. It will thus be possible to leave the gallery end of the air pipes free to expand and so reduce the stresses imposed on the pipe in single-borehole experiments such as Trial 55, which is running in shaft No. 1. This experiment is designed to give information on the behaviour of multiple bore-

Right: Reich drilling rig carrying out survey of coal seams for pilot plant

Development of directional drilling technique at Oxcroft Colliery using Boyle's experimental rig



Exit from horizontal borehole showing the reaming out of the hole

holes, particularly on the problems of controlling air flow to individual boreholes from a common manifold. New types of air governors and various emergency borehole closure devices will also be tested.

The trial running in shaft No. 1 is a single blind borehole experiment, the borehole being 178ft long with high chrome iron pipe of $2\frac{3}{4}$in bore with the inbye 70ft protected by refractory pipes. This trial was ignited on 2nd July last and was primarily designed to test the suitability of high chrome iron as air pipe material.

As in all such experiments, however, the opportunity has been taken to obtain as much additional information as possible and a pattern of vertical boreholes has been prepared down to seam level through which readings of temperature and pressure together with gas samples can be obtained to establish the spread of the reaction underground and the reactions taking place at particular points.

In shaft No. 2 a single blind borehole experiment with a mild steel air tube protected throughout with refractory piping was concluded earlier this year and during our visit to the site we saw the air pipe and other materials recovered from this experiment on the surface near shaft No. 2. Following the extinction of this experiment vertical drilling was carried out from the surface to establish the shape of the reaction zone obtained and this drilling showed a very regular pattern with an overall width of between 27 and 29ft. It also showed that the experiment, which had already run for about five months, could probably have been carried on for as long again. Horizontal drilling is now going on in shaft No. 2 in preparation for a further series of experiments with different types of air tube materials.

It is important to establish a suitable air pipe material which, while capable of withstanding the high temperatures obtained in the reaction, will not be too costly. As the air pipes have to be taken down the shafts and galleries and then inserted in the boreholes which are roughly at right angles to the galleries, they have to be handled in fairly short lengths and be capable of being jointed underground to give an airtight joint which will withstand the temperature conditions.

Preliminary tests on suitable materials are carried out on the surface in what are referred to as " trench tests." In these tests a dummy coal bed containing about 20 tons of coal is prepared with a dummy borehole in which lengths of air pipe can be tested under conditions approximating to the conditions in an underground borehole. The coal which is contained in such a bed enables gasification to be carried out for four or five days during which time extensive readings of temperature are taken. At the conclusion of the experiment the lid of the bed can be removed and the remaining air pipe examined.

In addition to the above major experiments a continuing programme of minor experimental work is carried on, particularly in connection with such problems as the ignition of the coal, air governors, air pipe jointing methods, etc.

Telecommunication Manufacturers

THE reasons why the telephone service should be the last to receive a cut in capital investment were given by Sir Thomas Eades, chairman of the Automatic Telephone & Electric Co., when he proposed a toast to the Post Office telephone service at the annual dinner of the Telecommunications Engineering and Manufacturing Association on 13th November. He said that telephone equipment was one of the most valuable exports because of its high labour content, and 40 per cent or more of the telephone equipment manufacturers' output went overseas. In the 1957-58 Estimates £48 million was set aside against depreciation of plant, £18 million more than previous depreciation allowances, so making an £18 million anti-inflationary contribution by the Post Office. Further cuts would, therefore, appear unjustified.

Sir Thomas congratulated the Post Office for their technical courage and instanced the development of the coaxial cable and the use of radio relay systems, both of which could be used for the distribution of television programmes, and multi-channel telephone circuits. He said that the proposed new Commonwealth cable would use a new type of cable with the British-developed rigid repeaters, so that there would be 60 channels on one cable instead of 36 on two.

The response was made by Mr. Kenneth Thompson, M.P., Assistant Postmaster General, deputising for Mr. E. Marples, Postmaster General, who was presenting to Parliament the White Paper proposing full automation of the telephone system. He referred briefly to the implications of the White Paper which is reviewed elsewhere in this issue.

A toast to the guests was proposed by Dr. J. N. Aldington and Sir Harold Bishop, Director of Engineering, British Broadcasting Corporation, replied briefly. During the evening Sir Thomas Eades presented three T.E.M.A. awards to apprentices.

Hydro-Electric Plant Construction

SUMMARIES in English of 43 reports from 15 European countries concerning " mechanisation in the construction of hydro-electric power plants " are contained in a 52-page document issued by the United Nations (Palais des Nations, Geneva, or local sales agents, at 3s). Brief abstracts, which facilitate selection of reports of individual interest, are also included with a note of where the full reports (in the language of the originating country) can be obtained.

Information is given of the importance of hydro-electricity production in relation to total output of several countries and the rate of its development and of notable reductions in construction times that have been achieved in recent years.

BUILDING EXHIBITION

Modern Techniques and Productivity

In this general view of the E.D.A. stand at the Building Exhibition the electrically operated brick hoist can be seen

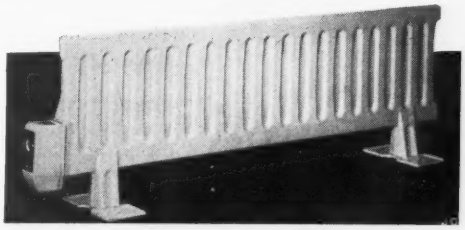
WITH the greater use of electrical aids in the Building trades it is surprising that at the twenty-seventh Building Exhibition now being held at Olympia, London, there are so few electrical exhibitors. There appears to be no reason for this, for the building and electrical industries are now more closely allied than at any other time. Not only is the electrical industry in a position to assist in the actual construction work and bring about increased building productivity, it can also provide an economical utilisation of fuel resources. Heating is one of the major considerations in any building project, whether it be private houses, multi-storeyed flats or office blocks, and more use is being made of electric under-floor heating methods. In almost all cases this type of heating is installed during the actual building process, and yet of the half-dozen or so manufacturers of floor heating equipment there is only one company, Panelec (Great Britain), Ltd., that has a stand of its own. Moreover, if one is to be guided by the Exhibition catalogue, there are only two manufacturers of electric fires to be seen, E. K. Cole, Ltd., and the General Electric Co., Ltd.

E.D.A. Display

It would seem, therefore, that the British Electrical Development Association, which has a striking and effective display on the ground floor, is on this occasion not only stressing the importance of the use of electrical equipment but is largely representing the industry alone. Among the labour saving electrically driven portable tools such as drills, sanders, etc., to be seen on the E.D.A. stand are drills with chasing attachments and circular saws for compound angle work. A house wiring section of the stand stresses the need for providing more socket outlets in houses and the old-fashioned methods of distribution are contrasted with the ring circuit wiring system. Typical domestic electrical appliances are exhibited and in a section devoted to the use of electricity for water heating, apart from showing the latest types of water heaters the importance of lagging the hot water storage tanks is emphasised. An eye-catching display is an automatically controlled, electrically operated brick hoist shown in actual operation. This machine is an adaptation of the "Comet" mobile hoist, manufactured by A.C.E. Machinery, Ltd. Powered by a 6 h.p. electric motor, it has a net lifting capacity of 7 cwt. Similar types of machines, either petrol engine or diesel driven, are more commonly used in this country and it is the hope of E.D.A. in showing this prototype model that the electric version will be more widely adopted for use.

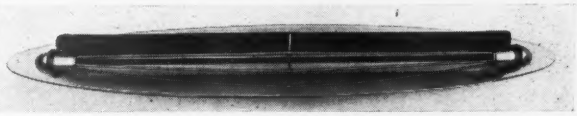
Finally, on the E.D.A. stand, the material used in and methods of installing electric floor warming in buildings are given in detailed form together with the running costs of some of the many installations which have been completed in various parts of the country in houses, flats, showrooms and libraries. Included among the manufacturers represented in this section are Thermodare, Calidec, Ltd., and Tyrad Electric, Ltd.

A typical arrangement of the Panelec floor-warming system for solid floor construction can be seen on this company's gallery stand. All normal floor finishes can be satisfactorily employed, including wood block, granolithic, terrazzo, lino, cork tiles, etc., and an average figure for the loading is 10/12 W per sq ft of area heating. The equipment, being embedded in the screed of concrete floors, takes full advantage of the thermal storage characteristics of the materials and is accordingly suitable for off-peak operation. The oil-filled electric radiator is another form of heating which has grown in popularity during the past few years and a full selection of thermostatically controlled radiators available in loadings from ½ to 2 kW are displayed by Dimplex, Ltd. On show for the first time at this Exhibition is the "Junior" 450 W model which is fitted with an excess temperature cut-out. It can be supplied with feet or wall bracket. Of special interest to architects and builders are the skirting board styled convectors in 2ft (300 W) and 4ft (450 W) sizes. These can also be built up in multiples to meet specific requirements. Also in the Dimplex display are two industrial type infra-red heaters, loaded at 2½ and 4 kW respectively, and a new 750 W infra-red domestic



Hurseal miniature oil-filled electric panel radiator

Dimplex 750 W domestic type infra-red heater

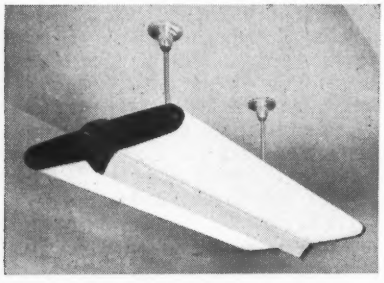


model. This is shown with a silica sleeved spiral element as well as an Inconel type.

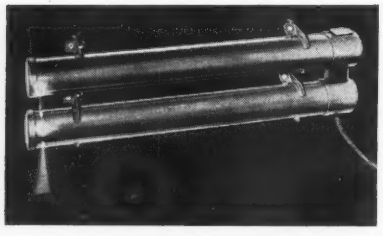
All the Hurseal oil-filled radiators are thermostatically controlled and a newcomer to their range is a 1½ kW model which measures only 11in high, when wall mounted, and is especially suitable for installation as floor level heating. The finish is in stoved enamel and the radiator is available in the standard colours of cream or bronze or eau-de-nil, sky blue, white or gold.

A wide display of electric heating equipment is also to be seen on the stand of E. K. Cole, Ltd., including a new 2 kW floor-standing convector heater. Known as type K, it is housed in an attractive stove enamelled metal case with gold coloured outlet grille. The weight is approximately 20 lb. The company's "Thermostor" 1½ and 2½ kW block storage heaters, for commercial and industrial use only, are also shown as well as radiant glass panel heaters, unit heaters in 3, 5 and 10 kW sizes and tubular heaters.

To meet the demand for a tubular heater embodying a visual indication when it is switched on, Siemens Edison Swan, Ltd., have produced a new tubular heater with pilot light. Whenever it is in operation a light projects forwards, backwards and on to the floor through narrow slots at one end of the tube. With a loading of 60 W per foot, the tubes are available in lengths ranging from 2 to 12ft. The company is also showing a selection of fluorescent, tungsten and mercury lamps including the new "Bradford" semi-recessed fluorescent fitting which is making its first appearance in London. Various methods of cabling are illustrated and other products on show include cables, switchgear, consumers' service units and telephone equipment.



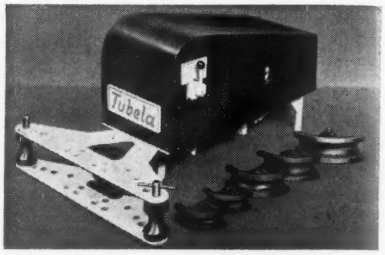
One of the new Ekco-Ensign pendant fluorescent lighting fittings



Siemens Ediswan tubular heater fitted with pilot light

Exhibits on the G.E.C. stand include examples of the company's most recent contributions to modern building techniques in the field of electrical installation equipment, lamps and lighting fittings. Under-floor ducting, overhead busbar, rising main and cable trunking equipment together with conduit fittings and accessories are shown. Among the lighting equipment are recessed fluorescent fittings specially designed for incorporation in acoustic tile ceilings.

A selection of lighting fittings suitable for industrial and commercial applications is displayed by the A.E.I. Lamp & Lighting Co., Ltd., and of special interest here is the recently introduced "Satina" commercial range. These satin-etched opal glass fittings are available in pink or white and in a choice of twelve shapes. A fitting which is designed principally for commercial interiors but which can be effectively used domestically when a semi-indirect pendant fitting is required is shown by Ekco-Ensign Electric, Ltd. One of the attractive features of this fitting is the plastic end plates which are available in a variety of colours.



Tubela Engineering Co.'s 2in motorised hydraulc tube bending machine

Many further improvements in consumers' control units have been introduced by Mantel Metalworkers, Ltd., and models to suit various types of structures are shown. With the introduction of electric floor heating the company have produced a unit to house the extra gear required together with the general services control gear. The whole range, which is available as semi-flush, flush and surface models, can also be fitted with circuit-breakers in place of fuses. Examples are also shown of their "Springlok" trunking range which includes new patterns specially adapted for lighting services. The latest addition to the range of tube bending machines manufactured by Tubela Engineering Co., Ltd., is their 2in motorised hydraulic bending machine. It comprises a standard winghead attached to a double acting ram unit above which is mounted a motorised high-pressure pump and control valve. A range of formers for ½in to 2in tubes is available. With this machine it is claimed that a 90 deg bend in a 2in tube can be made within 1¼ minutes.

A wide selection of portable electric tools of particular interest to the building industry are shown by Wolf Electric Tools, Ltd., including a new ¼in general duty drill, type OK2C, a ¼in heavy duty production drill, type KG2C, and a ½in two-speed drill, type TS24C. Bench stands for these machines are available. In the Contractors' Plant and Machinery section Auto Diesels, Ltd., are showing their transportable electric generators while many examples of the Lister power units suitable for use with all kinds of builders' and contractors' machinery are on view.

The Exhibition closes on 27th November.

Gasification Team Visits Russia

TO see the work that has been done on underground gasification of coal in the Soviet Union, a party consisting of representatives of the National Coal Board, the contractors responsible under the Board for the pilot scheme at Newman Spinney, near Chesterfield, described on page 942, and the consultants for the project left this country on 17th November. They will spend about two weeks in the Soviet Union, and next March a party of Russian experts will visit this country.

The members of the British team are Mr. J. Norval (chairman, Underground Gasification Executive, N.C.B.), Mr. W. M. Noble (deputy production director, East Midlands Division, N.C.B.), Dr. A. E. Balfour (deputy head of underground gasification, Humphreys & Glasgow, Ltd., contractors for the Newman Spinney project), Mr. J. H. Lander (Sir Alexander Gibb & Partners, the N.C.B.'s consultants for the Newman Spinney contract) and Mr. F. E. Warner (Cremer & Warner, consulting chemical engineers, also consultants on the Newman Spinney contract).

Distribution Systems

EARTHING OF LOW- AND MEDIUM-VOLTAGE EQUIPMENT

By F. MATHER, M.I.E.E., Assoc.M.C.T.

A PAPER read before the Supply Section of the Institution of Electrical Engineers on 20th November describes experience within the North Western Electricity Board of protective multiple earthing (P.M.E.). This system is mainly applicable to overhead rural distribution systems, which differ from underground distribution systems in that there is no metallic path to ensure the safe return of earth-fault current from the premises of any consumer, or any non-current-carrying metalwork in the distribution equipment, back to the neutral point of the system.

If the system neutral is earthed by means of an electrode, and the consumers' appliance frames and framework of any distribution equipment are similarly earthed, it is generally impossible to ensure a sufficiently low fault-loop impedance.

As a result, insufficient current may flow to cause rapid operation of the fuses or circuit-breaker when earth faults occur in consumers' or supply authorities' equipment. Thus earth-fault current can flow indefinitely, following unusual paths, and dangerous voltages can appear in unexpected places.

The use of public water supply pipes for earthing purposes has been fairly successful in the past, but with increasing fuse ratings and the increasing use of non-metallic water mains and service pipes, it is unlikely that they will help much in the future. Furthermore, there are many rural premises without public water supply.

The difficulties of earthing in rural areas have been partly overcome by the use of earth-leakage circuit-breakers or continuous overhead earth wires, but each of these methods has disadvantages.

The system known as "neutralising," in which non-current carrying metalwork is connected to the neutral, has the advantage that a metallic return is available to carry earth-fault current back to the system neutral. However, the conseqences of a break in the neutral conductor, as in Fig. 1, could be serious since it would result in all appliance frames beyond the break becoming alive at full system voltage whenever an appliance was switched on.

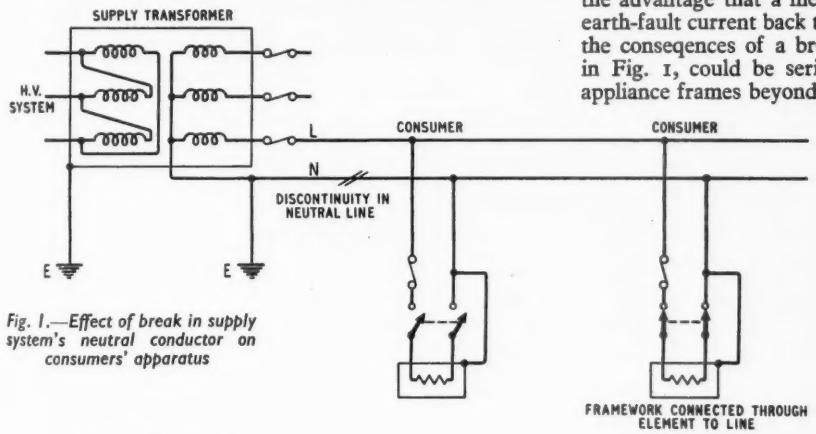


Fig. 1.—Effect of break in supply system's neutral conductor on consumers' apparatus

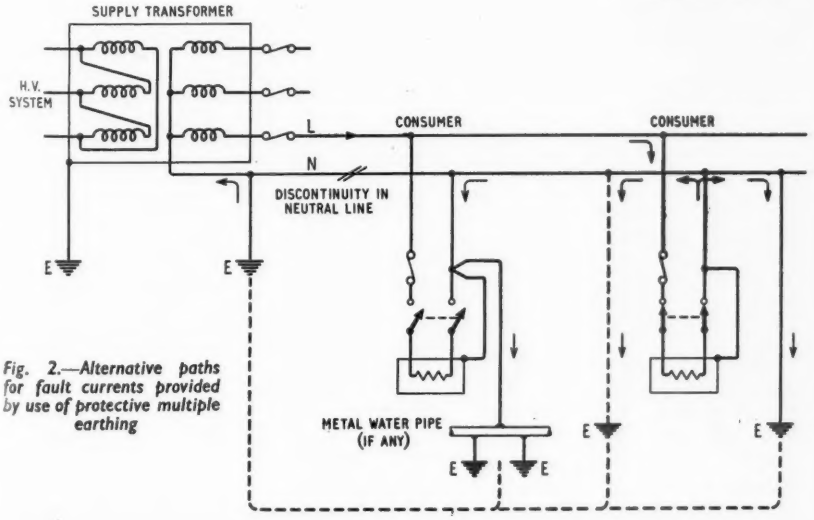


Fig. 2.—Alternative paths for fault currents provided by use of protective multiple earthing

Protective multiple earthing is simply neutralising with the addition of earth electrodes at the end of each distributor neutral and, if necessary, at intermediate points along the route. Thus in the event of neutral break, as in Fig. 2, there are alternative paths for load current or fault current, back to the neutral point of the system.

Protective multiple earthing is not new; it was the subject of a most comprehensive investigation by Dr. H. G. Taylor in 1937, after which the original "Special Regulation and Approval to Multiple Earthing" was produced by the Electricity Commissioners in 1940. The requirements were, however, so difficult and costly to meet in practice that very little use could be made of the method.

Later the Electrical Research Association gave considerable thought to the cost and efficiency of earthing, and found that certain relaxations could be made in the P.M.E. regulations, thereby reducing the difficulty and cost of applying them, without

seriously affecting the protective efficiency. The Ministry of Power thereupon issued relaxed regulations which now appear as Appendix F of the I.E.E. Regulations for the Electrical Equipment of Buildings.

Important provisions of the relaxed regulations are the following:—

(a) The overall resistance to earth of the neutral conductor of each complete distribution system shall not exceed 10 ohms and shall be such that the fuses or circuit-breaker protecting the high-voltage side of the supply transformer will operate in case of breakdown between windings.

(b) Unless there are two or more distributing mains from the transformer there shall be a separate earth electrode at the transformer.

(c) There shall be a connection from neutral to earth at or near the remote end of each distributor and branch. This may consist of an electrode or a connection to the metallic pipes of a water supply system.

(d) If necessary to comply with (a) further earth connections shall be provided along the run of the neutral conductor.

(e) No fuse, circuit-breaker, link or single-pole switch shall be included in any conductor connected to the neutral on the consumer's side of the supply terminals.

(f) If protective multiple earthing is used it shall apply to all consumers on the particular system.

The effect of (e) was to make it difficult and costly to apply P.M.E. to existing systems where double-pole fusing was used throughout the consumer's installation. However, a relaxation was granted in respect of existing installations since double-pole fusing is no more detrimental on a P.M.E. system than on a normal system. This has been of considerable assistance in improving matters in rural areas where earthing conditions were thoroughly unsatisfactory. A further minor relaxation permits the use of P.M.E. for premises supplied by overhead spurs from underground distribution systems, subject to certain requirements.

The net effect of the relaxations has been to make P.M.E. a practical and economical system and in the area of the North Western Electricity Board there are now more than 1,200 separate electrical systems with protective multiple earthing, supplying approximately 5,400 rural consumers.

Results of Tests

With modern methods of line construction, including duplicate line taps on neutral connections, there appears to be little danger of breaks in the neutral. No cases of broken neutrals have been recorded on P.M.E. systems in the area of the N.W.E.B. since the method was first used in 1949, but tests have been made on typical systems to determine what degree of danger would exist if distributor neutrals or service neutrals became open-circuited. The results may be summarised as follows:—

(a) Careful attention to the resistance and location of earth electrodes can minimise shock risk even if a break should occur in a distributor neutral or service neutral.

(b) An earth electrode or connection to a metallic water pipe system at all premises is a valuable safeguard in case of breakage of the service neutral. A relatively high-resistance electrode, say, 50 to 100 ohms, will reduce appreciably the voltage which can appear between bonded appliance frames and true earth.

(c) An earth electrode at the premises has a secondary beneficial effect since if a break should ever occur in the service neutral, current will flow through the electrode resistance and cause the fabric of the premises to rise in voltage with respect to true earth. This further reduces the shock risk within the premises.

(d) Calculated figures do not normally take account of the factor mentioned in (c) or the fact that, with all metal-work within the premises thoroughly bonded, shocks can only be experienced from the bonded frames to floors, walls, etc. Voltages measured with a high-resistance voltmeter at points where shock might be experienced are usually much less than the values measured to a remote reference electrode.

The conclusion is that protective multiple earthing is a safe and economical system and is of particular value when it is desired to improve the earthing arrangements in some rural territories where little attention has been paid in past years to co-ordination of the consumers' and the supply authorities' earthing systems.

Special Effect Lighting

SPECIAL effect lighting should not be thought of as applying only to dramatic productions, Mr. W. R. Stevens, M.I.E.E., F.I.E.S. (G.E.C. Research Laboratories), told a joint meeting of the Association of Supervising Electrical Engineers and the Institution of Engineers-in-charge in London on Tuesday last, but to any lighting job in which more than bare lighting was sought.

In the home it was desirable to have several sources of light setting off their surroundings and one another and to try to direct the light where it was wanted rather than flood it aimlessly about. Shop windows provided fascinating opportunities for special effects which were seldom fully explored. One of the best techniques, which had been in use for over 25 years, was the control of light by small specular reflectors, usually of silvered glass. When the tungsten filament lamp was used with fluorescent coated, high-pressure mercury lamps, both of which had the virtues of being relatively small and bright, the colour was excellent and in experimental installations an illumination of 1,000 lm/sq ft had been reached. This was comparable with a relatively bright day.

Compared with other forms of publicity, Mr. Stevens continued, floodlighting was cheap and he expressed surprise that more commercial organisations did not make use of it. As was so often true in lighting, an effect could be obtained with little effort or thought and the result often seemed satisfactory till it was compared with what should be achieved. The amount of light, for example, was often the least consideration; much more important factors were the direction and disposition of the lighting units.

An interesting example of where it was essential to secure large amounts of light, however, was the lighting of Niagara Falls. Here the large areas involved and the great distances the light had to be projected had always made it difficult to produce bright colours. In the new system the light source had been multiplied five times, in spite of severe restrictions on space and the amount of power available. By using a 150 A high intensity arc as the light source, it had been possible to introduce interesting optical effects. In particular it was no longer necessary to confine the display to narrow beams, each giving a small patch of light on the water; there would now also be long narrow beams, both horizontal and vertical, chosen to match the natural configuration. Facilities would also be provided so that the whole colour sequence for an evening on each of the twenty projectors could be operated automatically to a programme.

PARLIAMENTARY REPORT

"Package" Reactors

The Paymaster General, Mr. R. Maudling, was questioned by Mr. Roy Mason in the House of Commons last week about the progress Britain had made in the development of a "package" atomic reactor for export purposes, and what progress had been made in obtaining markets for this type of product.

Mr. Maudling said recent studies had suggested that the Calder Hall type of reactor should be capable of modification to produce electricity at a competitive price from small stations of about 20-30 MW capacity. In addition, a number of other reactor systems were being investigated that might be suitable for electricity generation in smaller power stations. Two United Kingdom firms had marketing rights for small power reactors of United States design. United Kingdom manufacturers had received a number of inquiries and were actively exploring possible markets for the types which they could offer.

Mr. Mason said there was a vast market waiting, and we should press ahead with advertising so as to attract all the nations that badly needed this source of power.

Mr. Maudling agreed, adding that research was going on into a very large number of reactors—pressurised water, heavy water gas-cooled, organic liquid-moderated reactors and other types.

Mr. Arthur Woodburn asked if the Minister was aware that the Americans were already booking orders in South America for this type of reactor and whether he was giving encouragement to firms in this country to get off the mark.

"In every way, we are doing that," said Mr. Maudling. "Some of our firms are acting as manufacturing agents for the American-type reactors but I understand that small reactors in construction for civil use in the United States are not operating as yet and, therefore, we have no proof of their reliability or economy."

Asked whether encouraging results had been achieved during our experiments on controlled thermonuclear fusion, Mr. Maudling said that the experimental apparatus known as ZETA was now operating at Harwell. Discharges through heavy hydrogen gas had yielded very high temperatures. Experiments were going on to identify the source of the accompanying neutron emission which probably arose from thermonuclear reactions but might possibly be due to other complex nuclear processes. Although the successful operation of ZETA was an important step forward, many major problems remained to be solved before the practical application of thermonuclear reactions could be considered and the work must be expected to remain in the research stage for some years. Research and development in this field were being given the highest priority.

Inspectors for Atomic Power Stations

Mr. Mason asked the Minister of Labour if he would consider setting up a department within the Factory Inspectorate to select and specially train inspectors for the atomic power stations.

Mr. Robert Carr, Parliamentary Secretary, replied that a training programme was being carried out covering protection against radiation hazards in industry generally, including atomic power stations. Four inspectors in the Chemical and Engineering Branch and 21 inspectors in the districts had already been trained, and 50 more were to be trained, under this programme. In addition two inspectors in the Chemical and Engineering Branch had received training in the design, maintenance and running of reactors. It was not considered necessary to set up a special department.

Reduced Telephone Charges

Mr. Ernest Marples, the Postmaster General, announced that from January next charges for telephone calls would be drastically reduced. Calls now costing 6d, 9d or 1s would all be reduced to 3d, and most trunk charges would be reduced. These changes, he said, paved the way for full automation of the telephone service, including trunk dialling by subscribers which would begin at Bristol towards the end of 1958 (see page 925).

Hire and Hire-Purchase Agreements

Mr. Cronin asked the President of the Board of Trade if the Government would introduce legislation to replace the existing emergency powers in respect of hire-purchase and hiring agreements.

Sir David Eccles replied, "Yes, Sir, but I cannot say when."

Purchase Tax Anomalies

Mr. Collins asked the Chancellor when he expected to complete the promised review of purchase tax anomalies.

Mr. Thorneycroft said he could give no undertaking. The alleged anomalies referred to in the Finance Bill debates were numerous and full consideration must inevitably take some time.

Patent Royalties

Mr. Vane asked the Chancellor of the Exchequer whether he was satisfied that the present law affecting income tax payable on royalties derived from patents was so framed as to encourage inventors to develop their work in this country rather than take it abroad.

Mr. Peter Thorneycroft said that patent royalties received by a resident in the United Kingdom were liable to income tax wherever the patent was exploited.

Asked by Mr. Vane if he would look into the whole matter again before next year's Finance Bill to ensure that inventors were not subjected to the temptation to take the fruits of their inventions overseas for exploitation, Mr. Thorneycroft said he would bear in mind any representations that might be made on this subject.

Investment Programmes

Mr. Thorneycroft informed Captain Pilkington that the latest estimates of the amount of investment for the current accounting years of the authorities concerned were: Electricity £274 million, railways £120 million, coal £100 million, gas £59 million and roads £25 million.

European Free Trade

In reply to Mr. Ellis Smith, the President of the Board of Trade said it was for every firm to assess the possible effects of the European Free Trade Area on its own products, and to plan how it could best adapt itself to take advantage of the opportunities of a wider market. The services of his Department were available to any firm which needed advice or information.

Restrictive Practice Cases

Mr. Wade asked the President of the Board of Trade if he was satisfied with the progress being made by the Restrictive Practices Court in view of the fact that the first case was not likely to be heard until next spring.

Sir David Eccles replied that the time when the cases were reached by the Court was a matter for the Attorney-General, but the first fruits of the legislation were really to be seen in the number of restrictive practices which had been scrapped rather than registered.

Asked whether the preliminaries could not be dealt with more quickly, Sir David said the Board of Trade had done its duty under the Act; it was now a matter for the Registrar of Restrictive Practices, who was independent. Questions about the court should go to the Attorney-General.

Later, in the debate on the Queen's Speech, Sir Toby Low said that the contribution made by the Government to industrial efficiency through the Restrictive Trade Practices Act was

already being felt; it was making a great impact on industry. An even greater contribution had been made by getting rid of the worst part of the demand inflation which existed a year or two ago.

Tax on Heat Pumps

"It would be quite impracticable to make a purchase tax tariff which was varied according to the efficiency of electrical appliances," Mr. Enoch Powell, Financial Secretary to the Treasury, told Mr. Arthur Palmer when he made an appeal for the tax on heat pumps to be reduced.

Mr. Palmer had said that he did not expect any concession immediately but the Government ought to consider the arguments more carefully than they had in the past. Taking heat from some low temperature source—a lake, a stream or, as was usual these days, from the soil—the heat pump had a startling performance as a fuel economiser. For every unit of electricity used, the device produced the equivalent of four units in heat form.

Once there was some kind of home market there would undoubtedly be great possibilities for it in the export markets. Many British electrical firms would consider the heat pump for export purposes if it were financially practical to develop it. What stood in the way was the crippling purchase tax rate of 60 per cent. It could be demonstrated that the heat pump, used in the average domestic installation, would save perhaps one ton of coal in a year, as against solid fuel. But the solid fuel appliance of an approved type bore no purchase tax at all. It seemed that the Treasury believed that this heat pump was just another electric heater or refrigerator, and had completely overlooked the enormous savings of fuel which it could make.

Mr. Powell said that most articles which attracted purchase tax, certainly in this group, were potential exports or were exported. It would be impossible to relate the tax to export achievement. If they were to single out one appliance and say that it should take preference because of its fuel-saving efficiency, they would find other appliances within the range for which it would be possible to make greater or less claim to exemption or preference. If Mr. Palmer's arguments in favour of the heat pump were sound, as he (Mr. Powell) believed them to be, there was no doubt that the advantage of this new development —its great economy—would, other things being equal, give it an advantage over alternative forms of heating.

Constitution of North of Scotland Board

Mr. Thornton-Kemsley asked the Secretary of State for Scotland when he proposed to replace the Rt. Hon. Thomas Johnston, aged 75, Sir Hugh Mackenzie, aged 69, Sir George M'Glashan, aged 72, and Mr. G. R. McIntosh, aged 69, who were, respectively, chairman, deputy chairman and members of the North of Scotland Hydro-Electric Board, with younger men.

Mr. Maclay replied that he had reappointed Mr. Johnston to serve as chairman of the Board for a further period until 31st December, 1958, and Sir Hugh Mackenzie and Sir George M'Glashan to serve in their present capacities until 31st December, 1959. He had appointed Mr. John Jardine to be a member of the Board until 31st December, 1960, in place of Mr. McIntosh, whose present appointment was due to end on 31st December, 1957.

Parliamentary Power Committee

A new Conservative Parliamentary Power Committee was formed at a private meeting of Conservative backbenchers at the House of Commons last week. The Atomic Energy Committee, of which Mr. Geoffrey Lloyd, the former Minister of Fuel and Power, was chairman, was formally disbanded.

The new Committee will deal with seven subjects: coal, gas, electricity, atomic energy, hydro-electric power, oil and steel. Col. Claude Lancaster (South Fylde) was elected chairman, Mr. Gerald Nabarro (Kidderminster) vice-chairman, and Lord Lambton (Berwick-upon-Tweed) secretary. Two sub-committees were set up, one dealing with oil and the other with atomic energy. The officers of the latter are Mr. Richard Fort (Clitheroe), chairman; Sir Ian Horobin (Oldham, East), vice-chairman; and Mr. David Price (Eastleigh), secretary.

On 27th November the Committee will hear speeches by Lord Mills, Minister of Power, Mr. Maudling, the Paymaster General, and Mr. David Renton, Parliamentary Secretary, Ministry of Power. Then they propose to debate every aspect of the Government's fuel and power policy. Special reference will be made to the present achievements of the coal industry and to the fear that the Government's anti-inflation campaign may be undermined if the price of coal is increased this winter as seems likely, taking into account the N.C.B.'s financial position and the rate of absenteeism in the pits.

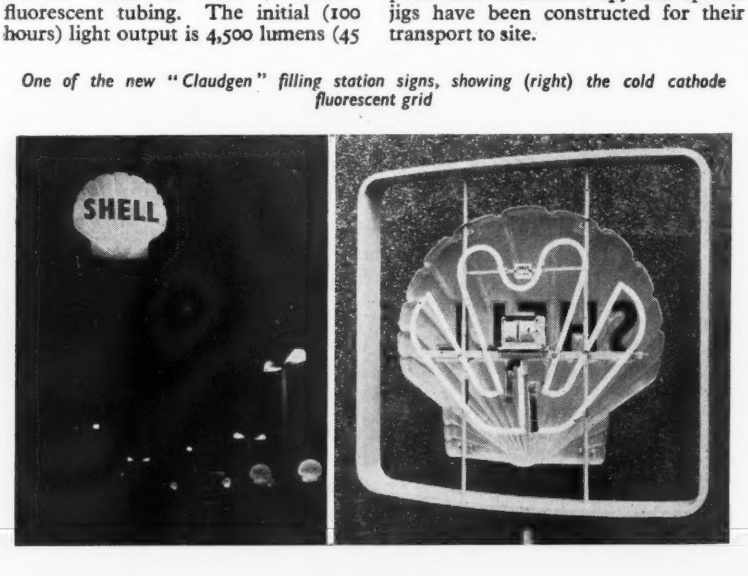
Petrol Station Signs

Readers will no doubt have noticed the appearance at many petrol stations of some new "Shell" and "B.P." illuminated signs. These are some of the three thousand or so which Claude General Neon Lights, Ltd., have already supplied to Shell Mex & B.P., Ltd., and many more are being erected.

In the production of the new signs the company had the assistance of the Council of Industrial Design and the results are very pleasing by both day and night. The casings are of moulded "Perspex" and appropriately-shaped cold cathode grids provide the illumination. The grid is formed from 20 mm "Cleora" fluorescent tubing. The initial (100 hours) light output is 4,500 lumens (45 lumens per watt), while the average over 20,000 hours, the estimated life of the grid, is 3,200 lumens. A specially designed transformer, with an output of about 120 mA, and a capacitor are mounted within the casing of the sign in such a way that no shadows are cast; the "daylight" illumination is remarkably even and unobstructed.

We had an opportunity last week of seeing the signs in production and, once again, admired the deft way in which the tubing is prepared and shaped. The signs, mounted in metal frames, are easily erected on their posts and connected up, and special jigs have been constructed for their transport to site.

One of the new "Claudgen" filling station signs, showing (right) the cold cathode fluorescent grid



D.C. WINDER DRIVES

THE discussion on "D.c. Winder Drives Using Mercury-Arc Rectifier/Invertors," a paper presented by Messrs. L. Abram, J. P. McBreen and J. Sherlock before the Institution of Electrical Engineers' Utilisation Section and reported in our last issue, was opened by Mr. B. L. Metcalf (National Coal Board). The new winder, he said, seemed to be doing everything that was asked of it. The main object was to reduce hoisting costs and this was very welcome. The authors did themselves less than justice in their description of the merits of dynamic braking, to which they had made a really useful contribution. A fair amount of space was devoted to cost, but on the information given it was not possible to make a proper economic comparison between the rectifier control and the a.c. drive. The poor power factor at starting increased the kVA drawn from the line, which made regulation worse than with the Ward-Leonard and a.c. systems and would probably add to the cost of the supply lines. There might be some gain in the housing of the rectifier as compared with the motor generator for a Ward-Leonard winder.

Term "Convertor" Preferred

Mr. J. E. Boul (English Electric Co.) said that the authors had done yeoman service in calling attention to the suitability of rectifiers for reversing drives. While these had been available in this country for many years, the fear of complexity and a measure of conservatism had delayed their application. He agreed that field reversal appeared likely to have a great appeal, but felt that the grounds for preferring it were narrower than the authors had represented. On terminology, he drew attention to Document 84 of the International Electrotechnical Commission, which recommended the use of the term "convertor," since the so-called rectifier had now to serve the dual purpose of rectification and inversion. The terms "figure 8" and "figure o" did not adequately differentiate between the three possible types of circuit and he advocated the use of the three self-explanatory and unambiguous terms, i.e. cross-connected convertor, armature reversal, and field reversal.

Dr. W. G. Thompson (General Electric Co.) considered that the paper marked another milestone in the successful application of the device and an example of increasing confidence in its use for all kinds of applications. The subject had been discussed before the war by mining engineers but most of the evidence came from the traction field. As a result of experience gained during the war in developing reversing drives for large machine tools using rectifiers and of increased knowledge of closed-loop control circuits, many technical uncertainties were solved. The authors had provided a practical answer to a number of questions and had shown how successfully the rectifier had coped with the raising and lowering of mine cages in the shaft.

Mr. I. A. Ferguson supported the conclusion that rectifier-controlled winders were superior to the a.c. variety and to a lesser extent the Ward-Leonard drive, with certain important reservations. Technical as well as economic considerations came into the choice. In his opinion, it was too early to decide whether field reversal was preferable to armature reversal. It would be safer to keep an open mind and see what happened.

Dr. E. Friedlander (General Electric Co.) suggested that the narrow limits specified at the beginning of the paper should not be taken too seriously. To some extent they would depend on the decking available. He regarded acceleration control as unnecessary and out-of-date.

Mr. H. Kemp (British Thomson-Houston Co.) pointed out that a rectifier-controlled drive affected the supply system by injecting into it harmonic currents and by imposing on it large reactive current peaks during acceleration, so causing appreciable voltage drops. Although this presented the more serious problem, it was not referred to in the paper.

Mr. Wilkinson commented that the battle between the a.c. and d.c. factions seemed to have given place to a new conflict of reversal *versus* armature reversal. In the mining industry it was hoped that the convertor, as it had now been called, would save space, transformers and rectifiers being placed in the tower of a tower-mounted winder where space was available. A filling of non-inflammable fluid would be necessary to prevent oil from going down the shaft in the event of a fire.

Mr. W. M. Brown pointed out that reference had been made to the use of armature switches on the Continent, but there were some equipments in satisfactory operation using field reversal. Mr. W. R. E. Taylor said that one of his difficulties in considering invertors was that the grid-controlled phase disappeared at the very moment when—as a result, perhaps, of a lightning strike or a.c. supply voltage transient—one did not get commutation. This might cause firing into the danger zone.

Industrial Radiography

THE non-destructive examination of materials by means of X-rays and gamma-rays has now become an accepted feature of industrial testing practice. Considerable importance is therefore attached to the recently published B.S. 2190 : 1957, which is based on radiographic techniques that are being and have been successfully used in industry. Although the adoption of the recommendations will assist in securing unified practice, the foreword to the Standard emphasises that the recommendations take the form of general guidance on the application of the various procedures at present being used.

This 45-page illustrated publication relates to the radiographic examination of fusion-welded circumferential butt joints in steel pipes in thicknesses up to 4in using the single wall technique, or 2in using the double wall technique. The recommendations assume the complete radiographic inspection of the welded seam, but they apply equally where only small sections (e.g. spot checks and radiographs of repaired sections) are to be examined.

Since exposure of any part of the human body to X-rays or gamma-rays can be highly injurious, the Standard includes a "protection" clause. One of the recommended precautions is measurement of the amount of radiation received by the worker, and particulars are given of the source from which films may be obtained for this purpose.

The Standard concludes with an appendix containing explanatory notes on the techniques. Among the ten subjects dealt with are: "Intensifying Screens," "Tube Voltage and Exposure," "Processing" and "Viewing."

Copies of the new Standard (which is a companion to B.S. 2600 on fusion-welded joints in thicknesses of steel up to 2in) may be obtained from the British Standards Institution, 2, Park Street, London, W.1, price 8s 6d.

NEW ELECTRICAL EQUIPMENT

Operation Recorder

An instrument which will provide a permanent, visible and indelible record of operations and events has recently been developed by FIELDEN ELECTRONICS, LTD., Wythenshawe, Manchester. It may be used for registering the on/off times of machines or electrical circuits, for showing the rate at which items are being produced in a repetitive process and for recording the times when vehicles are in a particular area. When used for recording production, this instrument can be complementary to a counter. The counter gives only the total number produced over a given period whereas if this is related to the recorder the rate of production at various periods during the day may be ascertained.

Two charts, twenty-four hour and seven day, are available. In both cases the chart is of specially prepared heat sensitive paper and an "inkless pen," consisting of a heated stylus, draws an indelible trace upon it. The pen is energised from a low voltage source and has a power consumption of less than one watt. Both pen and chart are driven by self-starting synchronous 50 c/s clock motors.

The only external equipment necessary is a pair of contacts which will "make" when it is required to produce a trace on the recorder and these contacts should be capable of handling the power required by the pen. When the contacts are closed and the stylus is heated, a black line approximately $\frac{1}{16}$in wide is produced. During the off periods a lower voltage is applied to the pen producing a faint, thin line on the chart. The difference between these lines is very clearly visible but the thin line does enable the trace to be followed even though no operations have been recorded.

The instrument is supplied in a die-cast aluminium case with a chart approximately 10in in diameter and is designed to operate from a mains supply of 230 V, 50 c/s, single-phase. The single point model is priced at £29 17s 6d. Multi-point recorders are also available.

Cable Drum Carrier

A heavy duty cable drum carrier, capable of handling drums up to 4 and 5 tons, has been introduced by DALE ELECTRIC (YORKSHIRE), LTD., Electricity Buildings, Filey, Yorks. This new model, size 3 "Roll-A-Drum," is a much heavier piece of equipment than previous types. It is in two separate units which can be arranged to accommodate drums of any width. Connection is by an adjustable link and it can be conveniently carried by two men. Specially designed ramps are provided which fold over for easy transportation. The price of the complete unit is £49.

Infra-red Heating Units

The latest additions to the range of infra-red spot comfort heating units marketed by PHILIPS ELECTRICAL, LTD., Century House, Shaftesbury Avenue, London, W.C.2, are types TIC/250, fitted with 250 W clear fronted lamps; TIR/250, fitted with 250 W red fronted lamps; and TIC/375, fitted with 375 W hard glass lamps.

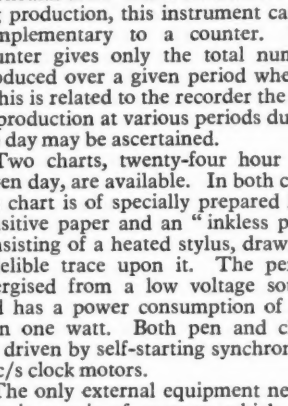
Essentially the fitting consists of three single units, each supplied with varnished glass braided cable suitable for operation at temperatures up to 150 deg C. The mounting heights are 10ft 6in (250 W) and 12ft (375 W). The prices are £10 18s (TIC/375) and £10 6s (TIC/250 and TIR/250).

The company has also introduced a range of agricultural infra-red heating units, based upon previous models (now discontinued) but embodying several improvements. The new units, in natural finish, are attractive in appearance and require less storage space than the earlier models. The channel for double units is wired with butyl rubber insulated cable, a material claimed to be superior to other types in its resistance to deterioration through weathering and chemical attack, and able to withstand high temperatures.

Appliance Connector

An appliance connector now available from MYCALEX & T.I.M., LTD., Ashcroft Road, Cirencester, Glos., is designed to save the time spent in making temporary connections between mains supply and electrical apparatus to be tested or demonstrated. The company claims that the spring loaded, fully insulated terminals provide a method of making connections instantly, with perfect safety, and with the certainty that efficient electrical contact has been established. The three-terminal connector is provided with 6ft of three-core flexible for connection to a mains power point, or it can be permanently connected. The leads from the electrical equipment to be demonstrated or tested are inserted in the spring-loaded jaws of the appropriate terminals, the lid of the panel is lowered, and the circuit is automatically switched on. Disconnection is equally rapid and simple.

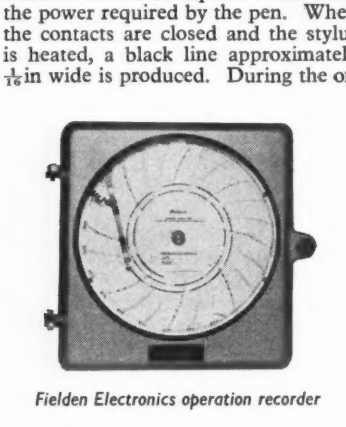
In a factory or a laboratory it may be more convenient to make up suitable panels from individual Mycalex quick-release terminals. They are



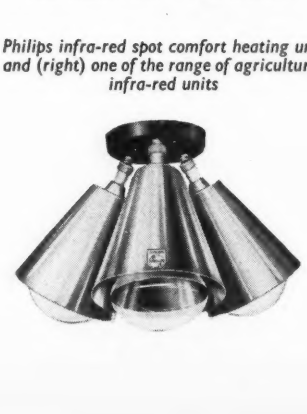
Fielden Electronics operation recorder

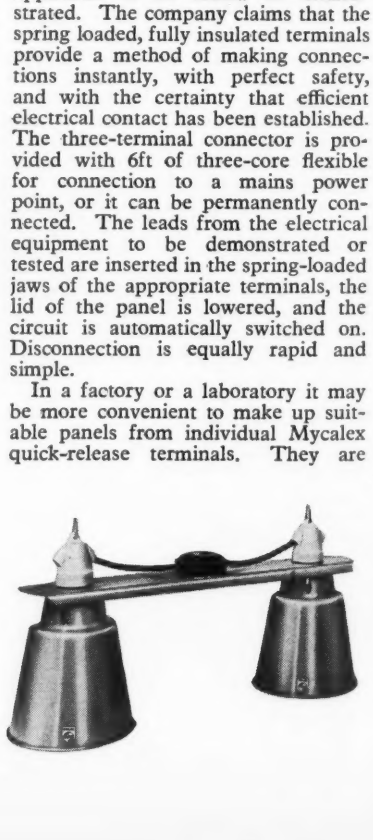
Dale Electric size 3 "Roll-A-Drum"

T.I.M. snap-action appliance connector



Philips infra-red spot comfort heating unit and (right) one of the range of agricultural infra-red units





supplied with red, green or black indicator tips to the insulated pillar. The pillar is deflected against an internal loading spring which, when released, grips the wire firmly between the brass insert in the base of the insulated pillar and a serrated brass contact plate. The T.I.M. snap-action appliance connector is priced at £4 10s and the Mycalex quick-release terminals at 4s 3d.

Heavy Duty Box Furnace

A general purpose heavy duty box-type unit has now been included in the range of furnaces manufactured by HEDIN, LTD., Commerce Estate, South Woodford, Essex. The unit, which has internal dimensions of 54in by 24in by 18in, is rated at 60 kW and has a maximum working temperature of 1,150 deg C. It is said to possess very efficient thermal insulation and other features worthy of note are the press-button operated door and non-distorting hearth. The heating elements are in heavy section 80-20 nickel-chromium and operate at a low voltage via a transformer. Elements are fitted into the door, as well as the walls of the heating chamber, to ensure an even temperature throughout.

The temperature control is fully automatic and includes safety devices such as an indicating controller which can be set a few degrees above the operating temperature, thus providing protection for the charge as well as the heating elements. A further safety measure is the inclusion of a second contactor, which takes over in the event of the contacts sticking on the operating contactor. There is also an E.A.C. single-phase preventer. In the event of one phase being affected, this instrument immediately cuts the other two phases, thereby preventing an out-of-balance load. The whole of this equipment is housed in a floor-mounted cubicle.

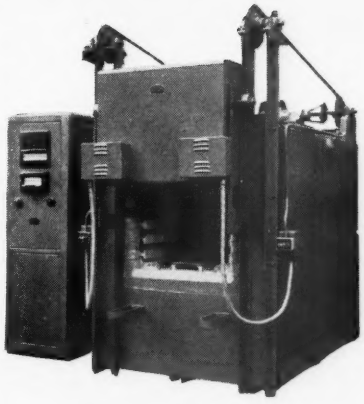
The rapid heating possible in these furnaces facilitates many heat treatment applications. Vitreous enamelling, for example, has been carried out in them very successfully, and they are equally suitable for annealing, case-hardening, normalising, stress relieving and many other metallurgical processes.

Instrument Cathode Ray Tubes

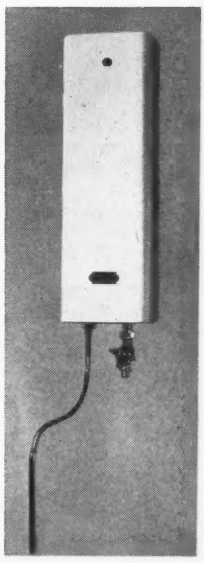
Two new instrument cathode ray tubes have been introduced by ELECTRONIC TUBES, LTD., Kingsmead Works, High Wycombe, Bucks. They are a 5in dia. precision oscillograph tube with two-stage distributed post-deflection accelerator (Type 5BKP1), and an inexpensive 2¾in tube of unusually high sensitivity (Type 3AFP1).

The 5in circular screen tube is claimed to have high sensitivity and low plate input capacitance and to be especially suitable for wide-band oscillography. The accelerator largely eliminates the distortions inherent in conventional p.d.a. systems. Thus high p.d.a. ratios may be used, with consequent improvements in brightness and deflection sensitivity.

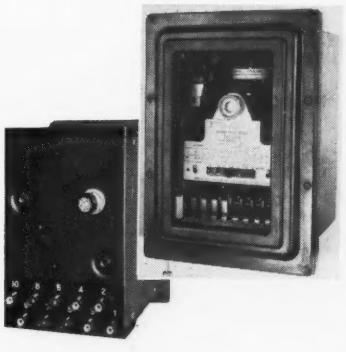
The 2¾in circular screen type is an inexpensive general purpose tube possessing high sensitivity, a drive of only 50 V to the y plates giving full screen deflection. The design of deflection amplifiers is therefore materially simplified, particularly at frequencies in the megacycle region. The tube is suitable for symmetrical or asymmetrical operation.



Hedin heavy duty box furnace



Watermatic instantaneous water heater



English Electric earth fault relay in a completely sealed case and back of dust-proof relay case showing the filter unit

Water Heater

An instantaneous type water heater capable of providing approximately 2 to 3 pints of water a minute continuously is now being produced by WATERMATIC, 6, Newport Road, Cardiff. Neat and compact in design, it is attractively finished in white stoved enamel and is suitable for use at the sink or wash basin. It measures 19in in height by 6in wide by 4¾in deep. The loading is 3 kW and models are obtainable for 200/220 and 230/250 V. An indicator lamp is fitted and the price is £11 10s 6d plus £5 1s 2d purchase tax in the United Kingdom.

Dust-Proof and Completely Sealed Relays

Two new types of relay case, one dust-proof and the other completely sealed, are now being produced by the ENGLISH ELECTRIC CO., LTD., Stafford. Dust-proof cases are for use in such installations as flour mills, cement works and steel works where dust can be "breathed" into a normal relay case owing to changes in ambient temperature. Completely sealed cases are essential under conditions of extreme heat, humidity and bacteria, or for factories in which a corrosive atmosphere exists, and make it possible for these relays to be kept in service for up to approximately ten years without maintenance. Standard covers are still available for dust-free atmospheres.

For the dust-proof relay cases, breathing is effected through a filter that prevents the entry of fine dust but offers negligible resistance to air. The filter is fitted to the back of the case and contains a replaceable unit of shredded nylon to stop dust particles. Iron particles are trapped by a magnetised grating in the cap of the filter. In atmospheres in which iron particles are prevalent, they can easily be removed from the grating without it being necessary to replace the shredded nylon unit.

The completely sealed cases are plastic covered for protection against corrosive atmospheres, and contain a silica-gel indicator close to the glass to give visual warning of a leak. The relay operation indicator can be hand reset by a push-button on the relay case, the operating rod passing through the case being spring loaded and sealed with a gasket.

GENERATION AND DEVELOPMENT

Boards' Domestic Appliance Sales

The accompanying table shows the number of new appliances sold by Area Boards in England and Wales for the year as well as the quarter ended 30th September, 1957, together with percentage changes over corresponding periods of the previous year. When assessing the figures, it must be remembered that the sales by Area Boards represent only a part of total sales throughout the country.

Sales of Appliances in Quarter and Year Ended 30th September, 1957

	Quarter	%	Year	%
Cookers	59,113	+ 15·4	226,610	+ 9·6
Water Heaters:				
Immersion ...	45,658	+ 12·5	139,792	+ 2·7
Storage ...	10,403	+ 0·4	41,619	− 2·0
Washboilers ...	20,574	+ 25·9	78,279	+34·1
Washing Machines	19,288	+ 15·3	72,575	−16·3
Refrigerators ...	21,017	+106·3	48,308	+34·2

Writ Served on Farmer

A petition with 14,000 signatures in support of his case was delivered to the Ministry of Power last week by Mr. D. J. Glanfield, the Surrey farmer who is objecting against the erection of a supergrid line across his land. The petition asks for a full investigation into the "outrageously inadequate protection afforded to persons on whose land the electricity authorities plan to place pylons and electric cables."

The C.E.A. stated last Saturday that a writ had been served on Mr. Glanfield claiming an injunction restraining him from interfering with the operations of the Authority's staff in completing the line.

Output in October

Last month 8,089 million kWh was generated by the Central Electricity Authority, the South of Scotland Electricity Board and the North of Scotland Hydro-Electric Board. This was 5·6 per cent more than in the corresponding month of 1956, compared with an increase of 10·7 per cent in September. As shown in the accompanying table, the average rate of increase so far this year is 3·2 per cent. An additional 169 MW of generating plant was installed during October, at the end of which the total capacity was 25,861 MW.

In the four weeks ended 26th October 859 million kWh was generated by industry (including 40 million kWh at the Calder Hall nuclear power station), an increase of 7·6 per cent.

Reversible Pumping Station

The North of Scotland Hydro-Electric Board has brought into service the Sron Mor power station (Glen Shira scheme) in Argyll. The station, which has a capacity of 5 MW, is situated at the top of Glen Shira about 1,000ft above sea level and is fed from the large high level reservoir of the scheme, discharging into the small lower reservoir from which the main 40 MW Clachan power station is supplied.

Sron Mor is a reversible pumping station which will either generate electricity from water drawn from the main reservoir or, in times of wet weather, pump surplus water back from the lower reservoir to the main reservoir for future use. The turbo-generator was manufactured by the English Electric Co., Ltd., and the pump by the Harland Engineering Co., Ltd.

Air Pollution at Newcastle

Newcastle-on-Tyne City Council may be recommended to approach the Ministry of Health over the amount of dust and grit falling on the city. At a meeting of the Council, Councillor A. Grey alleged that six tons of dirt fell on the city each day, chiefly in the west end, and said that if the Central Electricity Authority used a better type of fuel at the Stella power stations there would be a corresponding reduction in atmospheric pollution. He added that he planned to call a non-political meeting with a view to having the matter dealt with at a national level. Newcastle City Council has declared one smokeless area covering 120 acres and two more are to be announced shortly.

All-Electric House

Mr. J. W. Moule, chief commercial officer of the South of Scotland Electricity Board, who visited Bristol on 11th November to address the I.E.E. Western Centre on "Floor Warming," earlier the same day "switched on" the first all-electric home in the Long Ashton district. The house, which is heated by electrical under-floor warming, is owned by Mr. J. H. Quick, A.M.I.E.E., who, with the help of his wife and an electrician, in one week-end laid 321 yd of Pyrotenax heating cable on the concrete floor. It was covered with 2in of cement screed and as soon as this had set underfelt and carpets were laid.

At the informal ceremony Mr. Moule emphasised that floor-warming was not an expensive toy but a proven and economical method of heating buildings.

Brighton's Winter Illuminations

On Monday last the Mayor of Brighton (Alderman Charles Tyson, J.P.) officially switched on the town's winter illuminations, which include fifty large ornamental lamplit arches. The scheme has been organised by the Western Brighton Traders' Association in conjunction with the Corporation.

OVERSEAS

New Zealand Cable Contract

In order to meet the strain on the capacity of the existing cable system and also provide adequate capacity for future requirements, the Auckland Electric Power Board has decided on a scheme of expansion and reinforcement which will include the provision of an additional power link between the Penrose substation of the State Hydro-Electric Department and the Quay substation of the Auckland Electric Power Board. For this purpose the Board decided to adopt a 110 kV underground cable system and British Insulated Callender's Cables, Ltd., through one of its New Zealand agents, the National Electrical & Engineering Co., Ltd., Wellington, has received a contract for some 22,500 yards of 110 kV three-core impregnated pressure cable which will have 0·2 sq in copper conductors and will be aluminium sheathed.

Supervisory and jointing services connected with the installation of the cable will be provided by the staff

ELECTRICITY GENERATED AND SENT OUT FOR PUBLIC SUPPLY

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total		
Central Electricity Authority ...	3,763	63	72·4	7,379	17	7,403	6,947	23,556
North of Scotland H.E.B. ...	13	—	1·2	23	133	161	160	840
South of Scotland E.B.	256	7	0·1	497	28	525	496	1,465
Total for October, 1957 ...	4,032	70	73·7	7,899	178	*8,089	7,603	25,861
Corres. total for October, 1956	3,965	64	34·1	7,483	162	7,661	7,205	23,615
Inc. or dec., per cent	+1·7	+9·7	+116·2	+5·6	+9·9	+5·6	+5·5	+9·5
Total to date (10 months) 1957 ...	36,539	695	381·0	70,943	1,662	72,716	68,314	
Total for corres. 10 months of 1956	36,155	747	328·8	69,066	1,228	70,431	66,167	
Inc. or dec., per cent	+1·1	−7·0	+15·9	+2·7	+35·4	+3·2	+3·2	

* The total figure includes generation by other methods amounting to 12 million kWh.

of B.I.C.C. Construction (N.Z.), Ltd. The value of the contract is £186,000.

Development in Victoria

The State Electricity Commission of Victoria is raising £2,350,000 by a new 5¼ per cent power loan to expand electricity supply and develop the brown coal resources in the Latrobe Valley.

Central Water Heater Control in Cape Town

A point of interest in the latest report received from the city electrical engineer of Cape Town (Mr. C. G. Downie, B.Sc., M.I.E.E., M.I.Mech.E.) relates to the central control of water heaters. Equipment installed at one of the Corporation's substations has been used for conducting tests and collecting information regarding its effect on the system peak load. When these tests have been completed an assessment will be made of the technical and economic advantages of such a scheme and the probable savings to be made by controlling the supply to water heaters throughout the area. An investigation was undertaken to detect and record spurious high frequency voltages on the low voltage network which cause inadvertent operation of relays in consumers' premises. For this purpose a lightweight portable oscillator incorporating accurate frequency control was constructed and proved of considerable value.

At the end of 1956 there were 91,902 consumers in the Corporation's area, of whom 80,238 were domestic. Total electricity sales were 702 million kWh (5·3 per cent increase). Revenue amounted to £3·4 million and there was an operating surplus of £127,459. The average price received for all supplies was 1·15d per kWh sold (domestic rate, 0·91d; cooking and water heating rate, 1·05d; water heating rate, 0·52d). Contracts were placed during the year for the first section of the new Athlone power station.

Power from the Congo

The Brussels correspondent of *The Times* reports that a Council of Ministers presided over by King Baudouin has decided to continue the preparatory work for the first dam of the large Inga project in the Belgian Congo. The scheme provides for the production of power from rapids between Leopoldville and Matadi and the economic development of the Lower Congo. The total cost is estimated at £1,128 million. A national institute will be given extensive powers to fulfil the scheme under the supervision of the Minister of Colonies. Construction of the first dam will be begun in the autumn of 1959 and the first supplies of power are expected to be available in 1964.

Contracts for Ceylon Project

Our Colombo correspondent states that the Ministry of Transport has announced the Government's intention to invite tenders for the construction of Stage IIB of the Laxapana hydro-electric scheme at the beginning of next year. Recently much concern was expressed regarding the delay in commencing work on the scheme.

Originally Stage IIB was estimated to cost Rs.150 million but it is now thought that the cost will be in the neighbourhood of about Rs.200 million (about £15 million). Financial assistance from the World Bank to the extent of about 70 per cent of the cost is being sought.

Sound-Film Projector

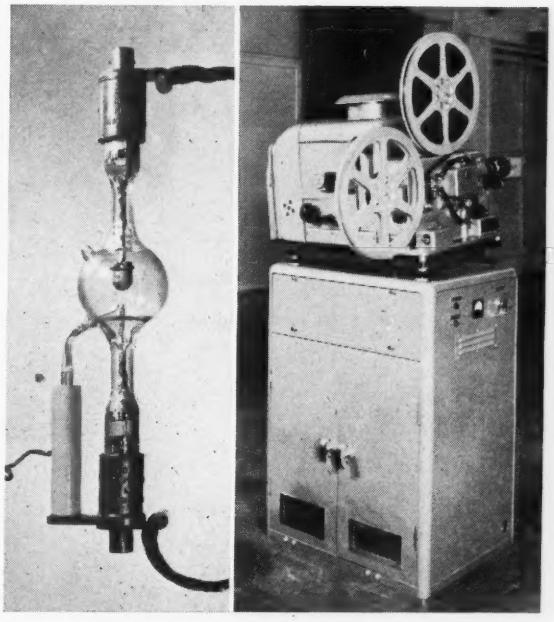
A 16 mm sound-film projector, known as the 450-X, introduced by B.T.H. Sound Equipment, Ltd., 5, Great Newport Street, London, W.C.2, incorporates a xenon lamp which provides a compact, high-intensity light source with the special advantage of horizontal operation.

The electrodes—anode, cathode, and igniter—of the Mazda Type XE/D lamp are enclosed in a gas-filled envelope. This is of fused silica, of almost optical quality, and sufficiently strong to need no protective casing. The light emitted extends over the whole visible spectrum from ultra-violet to infra-red. The "colour" is closely akin to natural sunlight, and reproduction of colour films is greatly improved. The lamp strikes-up to full brilliance immediately it is switched on. With a terminal voltage of 28/30 V d.c. and a maximum current of 100 A, it is rated at 2,000 W (nominal). The colour temperature of the light is approximtaely 5,600 deg K.

The lamphouse is arranged at right-angles to the axis of the projector, forming a compact assembly. It contains the lamp-mounting (adjustable for the initial alignment of the arc), the high-voltage supply unit for arc ignition and a condenser-lens/rear-mirror system which effectively puts the maximum amount of light into the projector. The lens system is cooled and the lamphouse ventilated by a small blower. Large doors allow easy access, but special interlocks are provided to prevent opening them while the lamp is alight.

The projector/lamphouse assembly is mounted at a convenient operating height on the supply cabinet; this contains a single-phase transformer and germanium rectifier, incorporating voltage-doubling and smoothing circuits; the d.c. output is 20/30 V at 100 A. For ease of servicing and maintenance, a standard 450 projector mains rectifier unit is included to power the projector motor and the 30 W amplifier. A 7in diameter axial-flow fan ensures adequate cooling of the germanium rectifier. The controls are arranged in a convenient position below the operating side of the projector, and consist only of push-buttons for the mains supply contactor and for the lamp. The lamp can be switched "on" or "off" at will. A mains-isolating switch-fuse is fitted inside the cubicle. The whole equipment will operate direct from a domestic 15 A a.c. power supply. The only other connection required is for the loudspeaker, and a socket is provided on the projector for this purpose.

Under normal conditions, with the projector running and using a 2in f1.5 projection lens, a total screen illumination of 1,000 lumens is obtained, representing about four times the light output of the modern 750 W tungsten-filament lamp.



B.T.H. sound-film projector equipment, type 450-X, incorporating the 2 kW xenon lamp

Financial Section

STOCKS and SHARES

ALTHOUGH still hesitant, the recovery movement in the Stock Exchange seemed at the beginning of this week to be gathering confidence. Activity broadened a little and in the case of most of the popular industrials a useful gap had been opened up between current prices and the three-year "low" points recorded a few weeks ago. Encouragement was drawn from the signs of a change of American financial policy in the direction of lower interest rates. Few people are counting on any early action affecting our own Bank Rate, but Government stocks have been kept very firm by a revival of investment on a moderate scale. Company news has again included a few disconcerting profit and dividend statements, although in the electrical markets it has again been satisfactory. Good figures from Joseph Lucas followed those of S. Smith & Son, and the preliminary results from Plessey showed earnings near to the previous year's level.

Better Prices

For a second week in succession the great majority of the changes in the electrical share lists have been for the better. A.E.I. repeated the previous week's advance of 1s 3d, while C. A. Parsons and A. Reyrolle were both half-a-crown to the good. Among heavy engineering shares Clarke Chapman were outstanding with a rise of 11s 3d to 130s, and higher prices ruled for Babcocks, Head Wrightson and Richardsons Westgarth. Plessey were firm after the announcement of the annual results, and in the radio group Decca "A" and Pye "A" were notably good at 24s 3d and 13s 9d respectively. In the domestic equipment group, Hoover recovered a further 3s 6d to 32s and Burco Dean at 13s 3d were favoured in advance of the dividend declaration due shortly: in May this company reported a much improved trading profit for the first half of the financial year, which ended in September. Cable shares took a general turn for the better: Enfield were 1s up at 14s 6d.

B.I.C.C. Interim

In the market, the interim report issued by British Insulated Callender's Cables was taken as reassuring. Estimates of lower earnings this year from the cable industry as a whole corresponded approximately with the disclosure that the B.I.C.C. group's trading profits for the six months ended in June were down to £3·88 million, against £4·29 million in the preceding six months and £5·16 million in the corresponding half of 1956. The volume of sales is stated to have been well maintained. For the fall in earnings, the principal reason is given as smaller profit margins, other factors being the dislocations attending re-planning schemes and the fall in the price of copper. In his statement, Mr. McFadzean thinks that further losses on the last-named account are unlikely, and that net profits in this half of the year will resemble those of the first part. Last year's earnings gave fully threefold cover for

Price Changes in

Company or Board	Nom. Value	Middle price 18th Nov.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	71½	+⅛	3	3	4 4 0	80	70
Brit. Elec. 1974/77	100	68	+⅛	3	3	4 8 3	78½	66
Brit. Elec. 1976/79	100	70⅛		3½	3½	4 19 3	81½	70
Brit. Elec. 1974/79	100	82	+⅛	4½	4½	5 3 9	92½	79⅛
Overseas Electric Supply								
Calcutta Elec.	£1	16/-	−6d	6†	6·8†	8 10 0†	19/-	15/-
East African Power	£1	20/-		7	7⅛	7 10 0	21/-	19/-
Nigerian Elec.	£1	16/6		10	10	12 2 6	18/6	16/6
Perak Hydro-Elec.	£1	16/-		10	12½	15 12 6	18/-	13/3
Electrical Shares								
Aberdare Cables	5/-	10/3		17½	17½	8 10 9	12/-	9/9
Aerialite	1/-	5/6x.d.	+3d	48	51½	9 7 3	6/9	4/9
Allen, W. H.	£1	36/9		10	10	5 8 9	47/3	33/6
Anglo-Portuguese Tel.	£1	21/3		8	8	7 10 6	27/6	20/6
Aron Elec. Ord.	£1	55/-		15	15	5 9 0	60/-	53/6
Assoc. Elec. Ord.	£1	52/6	+1/3	15	15	5 14 3	73/-	49/6
Automatic Tel. & El.	£1	55/-	−3/9	15	17	6 3 9	75/-	54/6
Babcock & Wilcox	£1	60/-	+3/-	15	15	5 0 0	82/6	54/9
Bakelite	10/-	22/3		16	15	6 14 9	24/6	20/9
Baldwin, H. J.	2/-	4/-		20	20	10 0 0	5/-	3/10½
Berry's Electric	5/-	6/-		—	10	8 6 9	6/6	5/6
British Aluminium	£1	43/-	+3/-	12	12	5 11 6	71/3	38/9
Brit. Elec. Traction: Def. Ord. "A"	5/-	18/-	−6d	22½	25	6 19 0	25/-	17/-
B.I. Callender's	£1	42/-	+1/-	12½	12½	5 19 0	55/-	40/9
B.I. Callender's 6% Pref.	£1	20/-		6	6	6 0 0	21/9	19/-
British Tabulating	£1	38/9	+1/3	9	9	4 12 9	56/3	37/6
British Thermostat	5/-	21/3		25	25	5 17 9	27/6	22/6
British Vac. Cleaner	5/-	5/-		15	10	10 0 0	8/-	5/-
Brook Motors	10/-	32/6		25	25	7 13 9	37/6	30/-
Bulgin, A. F.	1/-	5/-	+6d	50	40*	8 0 0	5/6	4/-
Burco Dean	5/-	13/3	+1/9	22½	20	7 11 0	14/-	8/9
Cable & Wireless: Ord.	5/-	9/6		10	10	5 5 3	12/6	9/6
4% Loan	100	91⅛		4	4	4 7 6	92½	89
Chloride El. Storage "A"	£1	58/9	+1/9	17½	17½	5 19 3	68/9	55/9
Clarke Chapman	£1	130/-	+11/3	22½	27½	4 4 6	9	5⅞
Cole, E. K.	5/-	16/9	+3d	17½	17½	5 4 6	23/6	16/6
Cossor, A. C.	5/-	5/3		Nil	2½	2 7 6	7/3	5/-
Crabtree	10/-	23/9		20	20	8 8 6	26/-	23/3
Crompton Parkinson Ord.	5/-	15/-		16	16	5 6 9	17/9	14/-
De La Rue	5/-	22/9	+1/-	30	35	7 13 9	24/9	16/3
Decca "A"	4/-	24/3	+1/9	43¾	43¾	7 4 3	32/3	22/-
Desoutter	5/-	31/6	−1/-	30	32½	5 3 3	35/6	27/6
Dewhurst	2/-	7/-	+6d	30	16½*	4 12 9	7/9	5/9
Dictograph Tel.	2/-	5/9x.d.		20	20*	6 19 3	6/3	5/3
Dubilier Condenser	1/-	3/3	+3d	30	30	—	8/1½	3/3
Duport	5/-	18/-	+1/-	23	25	6 19 0	21/-	17/-
E.M.I.	10/-	27/9	+1/3	15	15	5 8 0	36/-	23/9
Electrical Components	5/-	7/3		25	12½*	8 12 6	8/-	6/6
Elec. Construction	£1	23/9		8½	8½	7 3 3	27/6	21/9
Elliott-Automation	5/-	12/6		—	10‡	4 0 0	12/6	10/3
Enfield Cable Ord.	£1	14/6	+1/-	Nil	Nil	Nil	21/6	13/-
English Electric	£1	51/3		12½	14	5 9 6	65/-	47/6
English Electric 3¾% Pref.	£1	12/3		3¾	3¾	6 2 6	14/3	11/3
Ericsson Tel.	5/-	19/6		20†	22†	2 16 6*†	25/-	17/-
Ever Ready	5/-	15/3		35	37½	6 3 0*	20/-	14/3
Falk Stadelmann	£1	36/3		17½	17½	9 13 0	40/6	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

the 12½ per cent dividend, on the basis of which the £1 shares at 42s offer a yield of nearly 6 per cent.

Telephone Issue

Dealings were expected to begin to-day (Friday) in the new £1 ordinary shares of Automatic Telephone, of which 855,600 are offered to the company's ordinary and deferred stockholders at a price of 52s 6d each. Quoted shortly before the announcement at a little under 60s, the existing ordinary shares were at first marked down fairly sharply to 55s, but were later dealt in at around 57s in the market. On the subject of dividend prospects after this increase in the capital, a statement to shareholders anticipates that this year's trading results will be up to last year's, justifying the maintenance of the dividend at a total of 17 per cent on the present shares, and a payment of 4 per cent on the new issue.

Electrical Investments

Company or Board	Nom. Value	Middle price 18 Nov.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1957 Highest	1957 Lowest
Electrical Shares—continued								
G.E.C. Ord.	£1	41/3		14	12½	6 1 3	58/9	38/9
G.E.C. 6½ Pref.	£1	20/-		6½	6½	6 10 0	23/6	19/6
General Cables	5/-	12/6		30	30	12 0 0	15/6	11/6
Greenwood & Batley	£1	47/-		17½	17½	7 9 0	51/3	45/3
Hackbridge Holdings	5/-	11/9	+6d	30	20	8 10 3	21/9	11/3
Hackbridge & Hewittic	5/-	10/-		23	20	10 0 0	16/-	10/-
Head Wrightson	5/-	17/3	+9d	20	22½	—	24/3	16/6
Heatrae	2/-	4/9		15	15	6 6 6	4/9	4/-
Henley's	10/-	11/9	+6d	11½	11½	9 15 9	17/-	11/3
Holophane	5/-	21/9		30	37½	8 12 3	26/3	17/-
Hoover	5/-	32/-	+3/6	50	50	7 16 3	44/-	24/9
I.C.I.	£1	39/-	+1/-	10	10	5 2 6	46/6	36/3
Intl. Combustion	5/-	20/-		20	22½	5 10 0	30/-	19/3
Johnson & Phillips	£1	19/6	+3d	15	10	10 5 3	34/6	18/9
Lancashire Dynamo	£1	35/-		11	11	6 5 9	45/9	33/6
Laurence, Scott	5/-	14/3		15	15	5 5 3	19/9	13/9
Lister, R. A.	£1	25/-	+1/9	10	10	8 0 0	33/9	23/3
London Elec. Wire	£1	42/-	+1/3	12½	12½	5 19 0	53/9	40/9
Lucas, J.	£1	30/-x.d.	+9d	7½	7½	5 0 0	36/6	27/6
Marconi Marine	£1	31/3		10	10	6 8 0	37/-	31/-
Marryat & Scott	2/-	10/6		30	35	6 13 3	13/-	8/-
Mather & Platt	£1	47/6	+6d	15	15	6 6 3	63/9	47/-
Metal Industries	£1	23/3	+6d	Nil	9	7 14 9	30/-	20/3
Midland Elec. Mfg.	£1	47/6		12½	12½	5 5 3	52/6	45/-
Morphy-Richards	4/-	15/-		50	20*	5 6 9	20/-	11/6
Murex	£1	58/3	+1/3	20	20	6 17 3	79/6	58/3
Newman Ind.	2/-	2/9		10	10	7 5 6	2/9	2/1
Oldham & Son	1/-	2/6		17½	17½	7 0 0	3/-	2/3
Parnall (Yate)	5/-	6/3	+3d	12	12	9 12 0	8/9	5/9
Parsons, C. A.	£1	50/-	+2/6	8½	7½*‡	—	71/3	45/-
Plessey	10/-	65/6	+6d	30	30	4 11 6	86/3	61/-
Pye "A" Deferred	5/-	13/9	+1/3	12½	12½	4 11 0	20/-	12/-
Reyrolle	£1	76/3	+2/6	16½	17½	4 11 9	110/-	72/-
Rheostatic	4/-	7/9	+9d	18½	12½*	6 9 0	10/-	7/-
Richardsons Westgarth	5/-	14/6	+9d	16⅝	16⅝	5 15 0	20/-	13/6
Scottish Cables	4/-	13/9	−6d	27½	27½	7 17 6	19/3	13/9
Simon-Carves	5/-	23/9		28⅝	20*	4 4 3	36/3	23/9
Smith (England), S.	4/-	14/6x.d.		17½	20	5 10 3	16/-	12/9
Southern Areas	£1	11/3		7½	7½	13 6 9	20/-	11/3
Strand Elec.	5/-	6/3	+6d	15	15	12 0 0	8/-	5/9
Sturtevant	5/-	18/-	−6d	15†	15†	4 3 3†	27/-	18/-
Sun Elec.	£1	43/9		25	25	11 8 6	45/-	42/-
Switchgear & Cowans	5/-	9/9	−6d	25	25	12 16 3	15/6	9/9
Taylor Tunnicliff	5/-	11/9		15	15	6 7 9	13/9	11/9
T.C.C.	10/-	37/6		25	25	6 13 3	41/3	35/-
T.C. & M.	£1	24/6	+6d	8½	8½	6 18 9	31/-	24/-
Telephone Mfg.	5/-	5/3x.d.		10	10	9 10 6	8/-	5/3
Telephone Rentals	5/-	9/6		12½	12½	6 11 6	12/6	9/6
Thompson (John)	5/-	24/-		25	25	5 4 3	37/-	23/6
Thorn Elec.	5/-	20/9	+9d	15	17½	4 4 3	26/3	16/3
Thornycroft	£1	25/6x.d.	+1/6	12½	12½	9 16 0	37/6	21/3
Tube Investments	£1	53/9x.d.	+3/3	13¾	15	5 11 6	70/-	51/3
Vactric	5/-	15/9		17½	25	7 18 9	23/9	12/9
Veritys	5/-	7/9		12½	12½	8 1 3	9/3	7/9
Walsall Conduits	4/-	11/3	+3d	20	20	7 2 3	15/-	11/-
Ward & Goldstone	5/-	25/6	+1/6	35	40	3 18 6*	29/-	18/6
Watford	2/-	5/9		25	25	8 13 9	6/9	5/9
Westinghouse	£1	32/6	+2/6	18	9‡	5 10 9	41/3	28/9
West, Allen	5/-	10/-	+3d	15	15	—	13/6	9/6
Wolf Electric	5/-	9/-		20	20	5 11 0*	13/9	8/9

Lucas Results

Joseph Lucas (Industries) £1 shares were very firm at around 30s x.d. after the preliminary statement of the results for the year ended in July, during which the company's earnings are shown to have made good much of the ground lost in the previous twelve months. Although part of the improvement in the group trading surplus is taken away by larger provisions for taxation (exceeding £4·2 million) and depreciation, the net profit of about £2·4 million is still some £270,000 to the good. It provides practically four-fold cover for the ordinary dividend of 7½ per cent. The latter is at the same rate as before, and is supplemented this time by a special payment of 3d per share.

Ward & Goldstone

An interim dividend of 7½ per cent declared by Ward & Goldstone, whose financial year runs to March, represents a moderate improvement on last year's corresponding payment of 12½ per cent, before the doubling of the ordinary capital by a scrip issue. On the news, the price of the £1 shares was raised 1s 6d to 25s 6d, and stood in the now uncommon position of being much nearer the highest than the lowest of this year's quotations. The announcement encouraged hopes of a continuation of the progressive earnings and dividend record, for which credit was given in the last report to the company's policy of financing expansion through the retention of the bulk of each year's profits, which has provided shareholders with recurrent scrip issues and a rising return on their investment. Last year's distributions were equivalent to a total of 20 per cent on the present capital.

T.I. Report

Tube Investments £1 shares were marked up by about 3s 3d to 53s 9d x.d. after publication of the full accounts. These confirm the expansion of the 1956–57 net profit from £5·27 to £5·51 million (after tax of £6·63 million), and that the slightly higher ordinary dividend of 15 per cent absorbed less than a quarter of the available surplus. Of the latter, more than £4 million goes back into the business, in addition to the sum of £3·7 million put aside for depreciation. In the report, Sir Ivan Stedeford points out that the increase in profits reflected the inclusion for the first time of a full year's earnings from the companies recently acquired.

REPORTS and DIVIDENDS

Tube Investments, Ltd. — The annual meeting will be held on 9th December. The report and accounts now issued confirm the preliminary figures given in our last issue. Sir Ivan Stedeford (chairman), in his circulated statement, reports another record year. He says that T.I. will shortly be responsible for the production of some 900,000 tons of steel and it has become one of Britain's "big three" in the fabrication of wrought aluminium. A new company has recently been formed—Reynolds T.I. Aluminium, Ltd.—with a nominal capital to be held equally by T.I. and the Reynolds Metals Group of America. The new company has taken over the aluminium fabricating businesses, the South Wales Aluminium Co., Ltd., Reynolds Light Alloys, Ltd., and T.I. Aluminium, Ltd.

Dealing with the various divisions of the group, Sir Ivan says that the progress of the electrical division continues well. The Simplex Electric Co., Ltd., showed a further substantial increase in sales, those of "Creda" cookers going up 40 per cent to lead the field by a handsome margin. They look for a similar success with the "Debonair" spin dryer. Among other Simplex products which have done well is the range of flameproof switch and fuse gear, demand for which stepped up by 75 per cent. An interesting industrial installation contract was the switchboard controlling the main electrical services of the Pluto reactor at Harwell.

The cable company, Mersey Cable Works, Ltd., held its ground with slightly improved results in face of severe competition. Profit margins, however, are at present too vulnerable to the wide fluctuations of raw material costs which have beset the cable industry. The business of the Power Centre Co., which T.I. acquired last year, and which specialises in cable trunking gear, is shaping well. An additional 40,000 sq ft of factory floor space is under construction for this company, and should be ready shortly for occupation.

Altogether some fourteen T.I. companies, in the steel tube and other divisions, now produce a wide range of high precision and complex components for nuclear engineering, and they expect the range to be extended as continuing research resolves the technological problems. These activities are spread over so many subsidiaries that they have formed a new company—T.I. Nuclear Engineering, Ltd., to serve as a centre through which can be obtained all information relative to their nuclear industry operations.

Direct export returns showed a reduction, the first interruption of the upward course for some years. This was due to the reduced sales of the cycle division; other divisions, including the electrical, were generally good. The emphasis of their direct export trade shifted away from consumer goods to capital and industrial goods, which last year were predominant. The outlook for the current year is obscured by uncertainties, but present indications are that their operations will not be on quite the same scale as in the year just ended.

British Insulated Callender's Cables, Ltd., in a report on the financial results for the first half of the current year shows that the group sales amounted to £58 million, as compared with £68 million for the corresponding period of 1956. The trading surplus was £3·9 million (against £5·2 million), and the group net profit £1,264,000 (£1,999,000), of which £1,184,000 is attributable to the parent company. The interim dividend is unchanged at 4 per cent.

Mr. W. H. McFadzean (chairman) explains that the decrease in monetary value of the group's sales is more than accounted for by the lower prices ruling for copper, and that the physical sales volume has been well maintained. The decline in trading surplus is not due to any decrease in overall activity, the main reasons for the decline being the fall in profit rates, the dislocation caused by major replanning and re-equipment schemes and the effect of the fall in the price of copper. Mr. McFadzean states that the full implementation of the major replanning and re-equipment programmes will take some time but some benefits are already being enjoyed from the initial capital outlay and other steps taken.

The Automatic Telephone & Electric Co., Ltd., is making an issue to ordinary and deferred stockholders of 855,000 new shares in the form of rights on the basis of two new shares at 52s 6d each for each £7 of ordinary and/or deferred stock held. The consent of the Capital Issues Committee has been obtained. The directors state that on the basis of results to date, they expect that trading results for 1957 will be as satisfactory as those for 1956, justifying the maintenance of the total dividend for the year of 17 per cent on the existing ordinary and deferred capital, and the payment of a dividend of 4 per cent for 1957 on the new shares.

Joseph Lucas (Industries), Ltd.— The consolidated trading surplus for the year to 31st July last amounted to £5,881,941, as compared with £5,330,204 for 1955-56. Taxation absorbs £4,227,599, and the net surplus is £1,668,275 (against £1,519,722). Of this £479,440 is retained in subsidiaries, leaving a net balance attributable to the parent company of £1,188,835 (£1,282,386). It is proposed to pay a final dividend of 5 per cent, maintaining the dividend for the year at 7½ per cent, and it is also proposed to make a capital distribution of 3d per £1 ordinary share from the sale of investments in industrial companies outside the group.

Courtney Pope, Ltd., report that after providing £81,623 for taxation, the group net profit for the year to 31st May last is £61,557, as compared with £61,091 for the preceding year. The amount attributable to the holding company is £55,716 (against £54,415). It is proposed to pay a dividend of 30 per cent for the year (against 25 per cent), and in addition to pay a special bonus of 5 per cent. The balance carried forward is £25,361 (against £26,496 brought in).

Yarrow & Co., Ltd., report a group profit for the year ended 30th June last of £218,811, as compared with £165,493 for the preceding year. The figure is arrived at after deducting £277,000 for taxation and £50,000 for additions and improvements. General reserve receives £100,000 and it is proposed to pay a dividend for the year of 17½ per cent on capital increased by a 33⅓ per cent free scrip issue. This compares with 20 per cent for the previous year on the smaller capital.

The Heenan Group, Ltd., reports a trading profit of £496,062 for the year to 1st September last, as compared with £505,900 for 1955-56, and after providing £274,199 for taxation, the net balance is £221,845 (against £223,509). General reserve receives £143,142, and it is proposed to pay a final dividend of 7½ per cent, making 10 per cent for the year on capital increased by a one-for-one scrip issue. The distribution for the previous year on the old capital was 20 per cent.

Dictograph Telephones, Ltd.—The profit for the year ended 31st August last was £214,306, as compared with £196,085 for the previous year. Estimated taxation is £118,853, leaving a net balance of £95,453 (against £96,440). It is proposed to pay a final dividend of 10 per cent, making 20 per cent for the year on increased capital. A similar distribution was made for the previous year on the smaller capital.

The Perak River Hydro-Electric Power Co., Ltd.—The annual meeting was held on 14th November, Mr. H. G. Balfour (chairman) presiding. In the course of his circulated review of the past year, Mr. Balfour said that the maximum system peak load recorded in the year was 70·1 MW, which compared with 68·9 MW in the previous year, whilst the total number of kWh generated was 443·67 million or an overall increase of 1·72 per cent. The steam power stations at Batu Gajah and Malim Nawar together generated 243·84 million kWh, as compared with 241·06 million, whilst owing to heavier rainfall, the Chenderoh station gener-

ated 199·83 million kWh or 2·42 per cent more than previously. The overall thermal efficiency of the two steam stations increased from 18·14 per cent to 18·25 per cent, and it was anticipated that this would be considerably improved when the two new 12 MW sets and ancillary boiler plant now on order came into operation. The first of these sets should be available during the present financial year, and the second set should be ready for service during the first half of 1959. In view of the probable growth of load on the company's system during the next ten years and of the need gradually to replace older units of generating plant, the directors had under close consideration the provision of further new generating plant beyond the two new sets now on order. The future generating capacity was also dependent on the possibility of an early bulk supply from the projected Cameron Highlands hydro-electric power scheme of the Central Electricity Board.

Peña Copper Mines, Ltd.—Following the annual meeting on 9th December an extraordinary meeting will be held at which resolutions will be submitted changing the name of the company to Peña Industries, Ltd., and for the reconstruction of the capital of the company. The Peña group has four main divisions—electronics, metals, plastics and finance—which include majority holdings in Cosmocord, Tungsten Manufacturing Co., Absel and more than twenty other operating subsidiaries. The group also holds a substantial minority interest in Peto Scott Electrical Instruments, Ltd., and proposes, shortly after 9th December, to make an offer to the other shareholders in that company.

The Plessey Co., Ltd.—The trading profit for the year to 30th June last amounted to £1,486,722, as compared with £1,525,158 for 1955-56, to which is added interest of £61,583, making £1,548,305. Taxation absorbs £875,763, and the net balance is £674,924 (against £702,952). General reserve receives £250,000 and it is proposed to pay a final ordinary dividend of 15 per cent, maintaining the distribution for the year at 30 per cent. The balance carried forward is £1,180,558 (against £990,852 brought in).

Aerialite, Ltd.—The net profit for the year ended 31st May last, after providing £210,986 for taxation, was £179,087, as compared with £145,472 for 1955-56. It is proposed to pay a final dividend of 32½ per cent (against 30 per cent), making 51½ per cent (48 per cent) for the year.

Simon-Carves, Ltd., has declared an interim dividend of 7½ per cent (unchanged).

Rawlings Bros., Ltd., report a net profit for the year to 31st March last of £31,909, as compared with £58,505 for the previous year. It is proposed to pay a dividend for the year of 10 per cent (against 7½ per cent) and a bonus of 2½ per cent (nil).

Richardsons Westgarth & Co., Ltd., has announced an interim dividend of 6¾ per cent (unchanged) on increased capital.

Ward & Goldstone, Ltd., have declared an interim dividend of 7½ per cent (against 12½ per cent) on doubled capital.

Richard Johnson & Nephew, Ltd., have declared an interim ordinary dividend of 2½ per cent on the doubled capital (against 3 per cent on the smaller capital).

Thomas De La Rue & Co., Ltd., has announced an interim dividend of 10 per cent (unchanged).

Increases of Capital

New Day Electric, Ltd.—Increased by £60,000 in 5s ordinary shares, beyond the registered capital of £40,000.

Dubilier Condenser Co. (1925), Ltd.—Increased by £100,000, in 1s ordinary shares, beyond the registered capital of £650,000.

Phoenix Electrical Co. (London), Ltd.—Increased by £10,000, in £1 "B" ordinary shares, beyond the registered capital of £21,500.

Pye, Ltd.—Increased by £700,000, in 5s "A" deferred ordinary shares, beyond the registered capital of £5,300,000.

Whiteley Electrical Radio Co., Ltd.—Increased by £150,000, in £1 shares, beyond the registered capital of £50,000.

New Companies

Trinder & Geary, Ltd.—Registered 23rd October. Capital £3,000. To acquire the business of an electrical and general engineer carried on by C. W. Trinder at 15, Alexandra Gardens, Hinckley, Leics, etc. Directors: C. W. Trinder, Mrs. Elsie C. Trinder, W. Geary and Mrs. Constance V. Geary. Regd. office: 1, Trinity Vicarage Road, Hinckley, Leics.

Electrics (Redditch), Ltd.—Registered 17th October. Capital £1,000. To acquire the business of Estate Electrics, carried on by R. M. Jones and Maisie B. Jones at 185, Batchley Road, Redditch, to carry on the business of radio, television and electrical engineers, etc. Directors: A. Haigh and A. P. Haigh. Regd. office: 144, Great Charles Street, Birmingham, 3.

H. J. Smith & Co. (Radio & Television), Ltd.—Registered 17th October. Capital £2,000. Manufacturers of and dealers in and repairers of radio transmitting and receiving sets, television sets, etc. Directors: H. J. Smith and S. E. E. Wheatley. Regd. office: 273, High Road, Willesden, N.W.10.

David Pitts & Holt, Ltd.—Registered 29th October. Capital £3,000. To acquire the business of electrical engineers and contractors carried on by David Pitts at Bradford, etc. Directors: D. Pitts (permanent managing director) and Shirley M. Pitts. Regd. office: 413a, Cutler Heights Lane, Bradford.

Keen Electrical Supply, Ltd.—Registered 28th October. Capital £3,000. Manufacturers of and dealers in artificial lighting apparatus, etc. Regd. office: 23, Warser Gate, Nottingham.

J. B. Kilvington, Ltd.—Registered 25th October. Capital £1,000. To acquire the business of an electrical contractor carried on by J. B. Kivington at Hull, etc. Directors: J. B. Kilvington and Mrs. Betty Kilvington. Regd. office: 376, Anlaby Road, Hull.

Phillips Installations, Ltd.—Registered 31st October. Capital £100. To acquire the business of electrical and electronic engineers carried on by P. T. Phillips at Haywards Heath as "Phillips Installations." Directors: P. T. Phillips, Hazel C. Phillips and W. E. Tennant. Regd. office: 14, Broadway Chambers, Haywards Heath, Sussex.

Luxurylite, Ltd.—Registered 30th October. Capital £2,000. Electrical equipment specialists, etc. Directors: Amy A. Underwood and J. Underwood. Regd. office: 721, Christchurch Road, Boscombe, Bournemouth.

Telefittings (Chester), Ltd.—Registered 30th October. Capital £500. Contractors to television, radio and electrical trades, etc. Directors: F. W. J. Drake and E. M. Drake. Regd. office: Priory Farm, Old Chester Road, Great Sutton, Wirral.

Rogers of Woking, Ltd.—Registered 30th October. Capital £100. Electricians, electrical engineers, radio, radar and television engineers, etc. Directors: N. C. Rogers and Mrs. Winifred Rogers. Regd. office: 46, Esher Road, Walton-on-Thames, Surrey.

Welling Radio, Ltd.—Registered 14th October. Capital £5,000. Electrical engineers, etc. E. C. Perkins is the first director. Regd. office: 58, High Street, Welling, Kent.

Nuclear Utilities, Ltd.—Registered 15th October. Capital £100. Mechanical, electrical, precision and general engineers, etc. Regd. office: 6, Fitzroy Square, London, W.1.

Specialised Electronic Components, Ltd.—Registered 18th October. Capital £100. Manufacturers and distributors of electronic equipment and components, etc. Directors: A. J. Richards and D. R. Willmott. Regd. office: Lennox House, Norfolk Street, W.C.2.

Universal Electro-Automation, Ltd.—Registered 18th October. Capital £100. Manufacturers, importers and exporters of and dealers in radio and electronic components and instruments, etc. Solicitors: Christopher B. Carr, 29, Finsbury Square, London, E.C.2.

Farm & Industrial Electric, Ltd.—Registered 22nd October. Capital £1,000. Electrical, mechanical, radio, television, telephone, lighting, heating, motor and general engineers, etc. Directors: E. H. Turner and H. W. Broughton. Regd. office: High Street, Wheatley, Oxon.

Nu-Lyfe Electronics, Ltd. — Registered 22nd October. Capital £200. Manufacturers of and dealers in electrical and electronic equipment, etc. Directors: J. B. Frank and S. Smith. Regd. office: 43, Carrington Field Street, Stockport.

George Pitt & Company (Electricians), Ltd.—Registered 18th October. Capital £100. Directors: G. E. Pitt (chairman), Mrs. Mary E. Pitt and B. P. Pitt. Regd. office: 15, Great Western Road, Paddington, W.9.

Direct Cleaner Sales, Ltd.—Registered 18th October. Capital £1,000. Electrical engineers and contractors, etc. Directors: G. D. Linton, P. R. Rigby and Maude V. Linton. Regd. office: 791, Harrow Road, N.W.10.

Electronic Distributors (Exeter), Ltd.—Registered 21st October. Capital £100. Manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Directors: A. E. Powell, Mrs. Margery Powell and E. G. B. Wherry. Regd. office: 112, Sheen Road, Richmond, Surrey.

K. A. Causley, Ltd.—Registered 8th November. Capital £1,000. Radio, television, recording, electronic, musical instruments, electrical engineers and contractors, etc. Directors: K. A. Causley and Joy Causley. Regd. office: 53 and 55, Camden Road, Tunbridge Wells, Kent.

Bankruptcies

T. F. Mathias, Charles Court, Letterston, Pembrokeshire, electrical contractor.—First and final dividend of 1 9/16d in the £, payable at Government Buildings, 10, St. Mary's Square, Swansea.

J. Summerly, 93, Mowbray Road, South Shields, electrician.—Second dividend of 3s 9½d in the £, payable at the Official Receiver's office, Clarendon House, Clayton Street West, Newcastle upon Tyne, 1.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) will be obtainable after 27th November from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1952

16701. Sperry Rand Corporation.—Microwave energy distribution apparatus. 2nd July, 1952. (Addition to 743065.) (787070.)

1953

7835. National Research Development Corporation.—Electronic digital computing machines. 15th March, 1954. (786734.)

7985. Mullard Radio Valve Co., Ltd.—Particle counting apparatus. 23rd February, 1954. (786885.)

8231. Standard Telephones & Cables, Ltd.—Equipment for the storage of intelligence. 17th February, 1954. (786721.)

17762. Graviner Manufacturing Co., Ltd., Wilkinson Sword Co., Ltd., and Mathisen, A.—Electric supply apparatus and monitoring and controlling means therefor. 18th June, 1954. (786873.)

18843. Standard Telephones & Cables, Ltd.—Apparatus for generating timed pulse trains. 2nd July, 1954. (786722.)

34646/7. National Research Development Corporation.—Electrostatic information storage. 9th December, 1954. (786771/2.)

1954

86. Electroflo Meters Co., Ltd., Engel, F. V. A. E., and Engel, G. F. M.—Voltage conversion apparatus. 10th December, 1954. (786735.)

292. Spigerverk, C.—Electric furnaces. 5th January, 1954. (786954.)

1883. General Electric Co.—Conductor bar end fittings for direct-cooled dynamo-electric machines. 21st January, 1954. (786725.)

6703. General Electric Co.—Transistor amplifiers. 8th March, 1954. (786854.)

6858. General Electric Co.—Electric wave generators utilising semi-conductor devices. 9th March, 1954. (786875.) 6859. Semi-conductor arrangements. 9th March, 1954. (786876.)

9329. Standard Telephones & Cables, Ltd.—Magnetic equipment for storing intelligence. 30th March, 1954. (786724.)

12016. General Electric Co.—Liquid-cooled generator arrangements. 26th April, 1954. (786726.)

15123. Electric & Musical Industries, Ltd.—Image pick-up tube circuits. 23rd May, 1955. (787025.)

19984. Parsons, Ltd., C. H., and Handley, G. B.—Lever-operated electric switches. 7th July, 1955. (786957.)

23965. Davall & Sons, Ltd., S.—Thermally-operated electric switches. 17th November, 1955. (786856.)

25911. Telephone Manufacturing Co., Ltd.—Electromagnetic relays and apparatus incorporating such relays. 6th September, 1955. (786959.)

26851. National Supply Co., and Oil Well Engineering Co., Ltd.—Power amplifying means. 16th September, 1954. (786889.)

29766. Lacy, R. D.—Plural-phase electric motors. 13th January, 1956. (Cognate application 32940, 17th November, 1955.) (786744.)

30260. Thermionic Products, Ltd.—Magnetic records. 30th November, 1955. (Addition to 759486.) (786891.)

34947. Babcock & Wilcox, Ltd.—Tubulous vapour generating and vapour heating units. 30th November, 1955. (786962.)

37087. Telephone Manufacturing Co., Ltd.—Private automatic exchanges. 4th January, 1956. (787031.)

37315.—United Kingdom Atomic Energy Authority.—Cathode follower with transformer feed-back. 23rd December, 1955. (786964.)

37669. London Electrical Manufacturing Co., Ltd.—Hermetically sealed cased electrical condensers. 30th December, 1954. (786965.)

1955

1413. Plessey Co., Ltd.—Rotary pumps or motors. 5th March, 1956. (786966.)

2595. Alkaline Batteries, Ltd.—Alkaline type electric storage batteries. 12th January, 1956. (786781.)

3058. Kollsman Instrument Corporation.—Synchronous motor. 2nd February, 1955. (786751.)

3360. Licentia Patent-Verwaltungs-Ges.—Metal rectifier unit. 4th February, 1955. (786782.)

5054. Bode, H.—Frequency divider circuits, especially for electronic musical instruments. 21st February, 1955. (786787.)

8413. Walsall Conduits, Ltd.—Electric distribution panel. 20th March, 1956. (786971.)

9339. Decca Record Co., Ltd.—Pulse radar apparatus. 9th February, 1956. (786766.)

12540. British Insulated Callender's Cables, Ltd.—Electrical terminal connecting devices. 27th April, 1956. (786975.)

12809. Licentia Patent-Verwaltungs-Ges.—Power changing electric circuit-breaker. 3rd May, 1955. (786976.)

13356. National Pneumatic Co., Inc.—Field telephone hand set. 9th May, 1955. (786978.)

15439. Compagnie Générale de Télégraphie sans Fil.—Delay lines for high power discharge tubes. 27th May, 1955. (787058.)

17302. General Electric Co.—Electronic trigger circuits. 15th June, 1955. (786877.)

17303. General Electric Co.—Electrical control circuits employing a semi-conductor device. 15th June, 1955. (786878.)

17761. Philips Electrical Industries, Ltd.—Methods of manufacturing cathodes for use in electron-discharge tubes. 20th June, 1955. (787059.)

18972. Goodmans Industries, Ltd.—Loudspeakers and circuits associated therewith. 14th June, 1956. (787039.)

19903. Warren, S. D., and Burkard, R. F.—Electrolytic capacitors. 8th July, 1955. (786803.)

20611. Elesta, Ltd., Electronic Control Apparatus, Bad Ragaz.—Electric flame controller for supervising and controlling burners for burning liquid or gaseous fuels. 15th July, 1955. (786910.)

23169. Siemens & Halske Ges.—Means for producing an electric current which is substantially proportional to the pressure difference of two gas columns. 11th August, 1955. (786810.)

23224. Pertrix-Union Ges.—Galvanic stack batteries. 11th August, 1955. (786983.)

25097. Standard Telephones & Cables, Ltd.—Cathode-ray tubes. 1st September, 1955. (787042.)

25687. Gagliardi, G.—Automatic armature winding machine. 7th September, 1955. (786816.)

25851. Standard Telephones & Cables, Ltd.—Travelling-wave tube. 9th September, 1955. (786986.)

26532. Brush Electrical Engineering Co., Ltd.—Apparatus for the measurement of magnetic flux. 16th September, 1955. (786817.)

27091. Siemens & Halske Akt.-Ges.—Electron tube arrangements including magnetic focusing systems. 22nd September, 1955. (786988.)

30162. Standard Telephones & Cables, Ltd.—Circuit arrangements for markers in exchange systems, particularly telephone systems. 21st October, 1955. (786821.)

32191. Sperry Rand Corporation.—Pulse synchronising systems. 10th November, 1955. (786823.)

33411. General Electric Co.—Electric incandescent lamp. 22nd November, 1955. (786994.)

33870. Compagnie Générale de Télégraphie sans Fil.—Monochromatic cathode-ray tube circuits. 25th November, 1955. (786827.)

35498. Teleprinter Corporation.—Telegraph printers. 9th December, 1955. (786831.)

37325. Vereinigte Aluminium-Werke Akt.-Ges.—Continuous, pre-baked, anode for the electrolytic production of aluminium. 29th December, 1955. (786932.)

1956

64. Naamlooze Vennootschap Hollandse Signaalapparaten.—Electric brush holder. 2nd January, 1956. (786935.)

1015. Telefonaktiebolaget L. M. Ericsson.—Devices for generating a plurality of individual pulse trains. 11th January, 1956. (786837.)

1721. Compagnie Française Thomson-Houston.—Cooling of electronic tubes. 18th January, 1956. (786936.)

6479. Welding Supplies, Ltd.—Manufacture of coated electrodes for electric arc welding. 1st March, 1956. (786941.)

6766. Technicolor Motion Picture Corporation.—Scanning circuit. 3rd March, 1956. (787050.)

7882. Reutter, J. L.—Electromagnetic a.c. compressors. 13th March, 1956. (786942.)

8018. Buquor, A. P.—Lighting fixtures for tubular electric lamps and lamps for use in such fixtures. 14th March, 1956. (787001.)

9814. Bosch Ges., R.—Methods and apparatus for the manufacture of wound electric condensers. 29th March, 1956. (786943.)

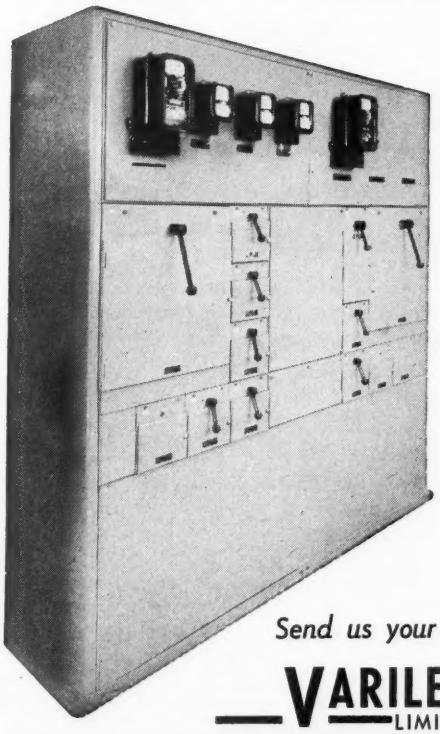
11982. General Electric Co.—Time-keeping devices. 19th April, 1956. (787002.)

13224. Montgomery Elevator Co.—Magnetic electric switches suitable for use as levelling units for elevators. 30th April, 1956. (787003.)

Report on Colliery Accident

Last June an explosion occurred at Barnburgh Main Colliery, Yorkshire, resulting in the loss of six lives and injuries to 14 other men. Mr. C. W. Scott, H.M. Divisional Inspector of Mines, in his report to the Minister of Power on the circumstances of the accident, says it is obvious that there was a large body of very rich firedamp mixture in the top part of the loading gate between the face ripping and the inbye back ripping immediately before the explosion and he feels that careful examination should have revealed the gas. He considers that the flash from a damaged cable was the cause of the explosion. This would have been avoided if the cable had been properly protected in accordance with Regulation 10 of the Coal and Other Mines (Electricity) Regulations, 1956. Examination afterwards showed that the 550 V switch, because of a mechanical defect of the tripping gear, could not trip on earth fault and the overload protection was also unreliable.

Cubicle Switchboards



by VARILECTRIC

UNIT CONSTRUCTION

embodying Combination Fused Switches from our ASTA Type Tested 30 MVA range. 60 amperes to 750 amperes. Standardised dimensions permit ease of assembly. Great flexibility of layout and facilities for extensions.

Our other products include:—

- RISING MAIN SYSTEMS
- CABLE TRUNKING SYSTEMS
- OVERHEAD BUSBAR SYSTEMS
- DISTRIBUTION FUSEBOARDS
- COMBINED DISTRIBUTION FUSEBOARDS AND ISOLATORS

Export Inquiries Invited
Specialists in meeting climatic conditions

Send us your enquiries and problems

VARILECTRIC LIMITED

10 MELON ROAD, LONDON, S.E.15

Telephone: Rodney 6895/6/7

LEGG INDUSTRIES LIMITED

Legg (Industries) Limited design and manufacture Charging Equipment for Electric Vehicles and Trucks of all types and the majority of leading manufacturers specify LEGG CHARGERS for use with their equipment—both at Home and Abroad.

WHEN YOU PURCHASE A LEGG CHARGER YOU ENSURE YEARS OF RELIABLE SERVICE

Chargers are also designed and manufactured to comply with C.S.A. requirements.

Legg VEHICLE CHARGERS

LEGG (INDUSTRIES) LTD.
WILLIAMSON ST., WOLVERHAMPTON

5723D

VIBRATION?

—You Can Jolt SLYDLOK FUSES

THEY ARE VIBRATION PROOF

Industry today demands fuses which are efficient, reliable, and will operate under adverse conditions if necessary. The SLYDLOK 'H' Type Vibration Proof Fuses meet these and many other requirements. They are available in 5, 15 and 30 amp ratings for rewirable or H.R.C. duty.

Information and supplies may be obtained ONLY direct from the manufacturers

EDWARD WILCOX & CO. LTD., WYTHENSHAWE, MANCHESTER 22

Telephone: WYThenshawe 2235

London Office: Fulwood House, Fulwood Place, W.C.1. Telephone: CHAncery 2206

dmEW92

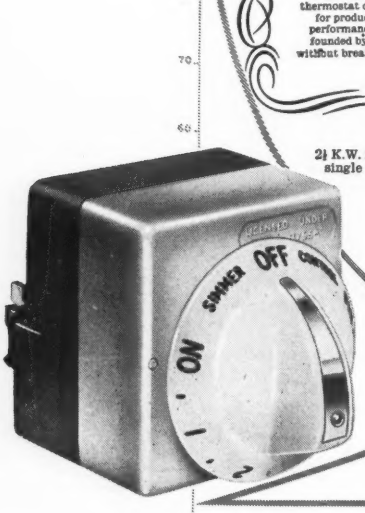
Since 1890 'DIAMOND H'

has been in the forefront of switch and thermostat design, establishing a reputation for products of exceptional quality and performance. The standard and tradition founded by Gerald Waldo Hart continues without break and with even greater success.

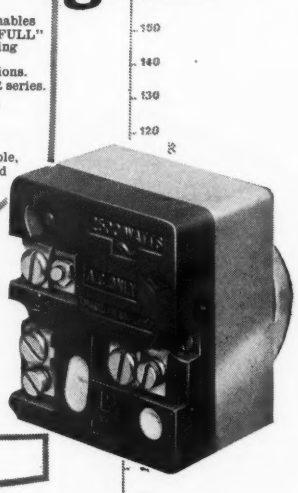
INTRODUCE Energy Regulators

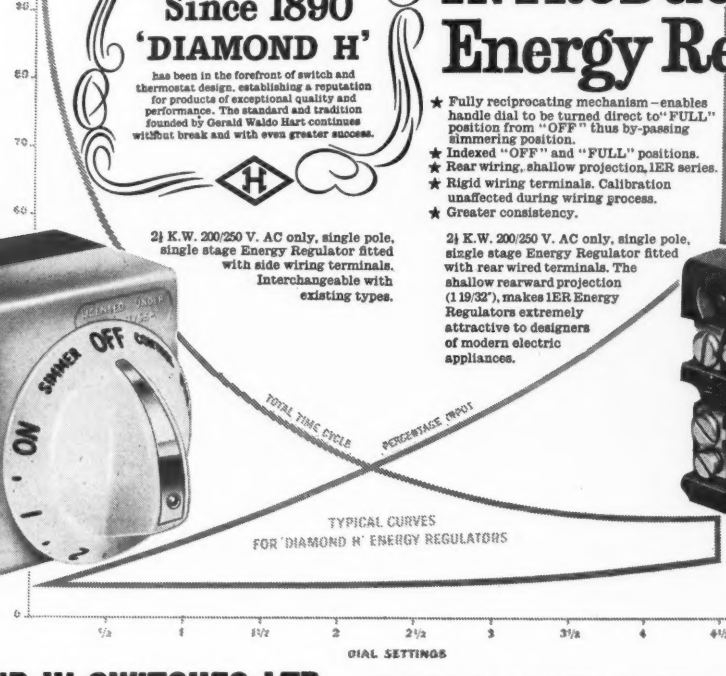
- ★ Fully reciprocating mechanism—enables handle dial to be turned direct to "FULL" position from "OFF" thus by-passing simmering position.
- ★ Indexed "OFF" and "FULL" positions.
- ★ Rear wiring, shallow projection, 1ER series.
- ★ Rigid wiring terminals. Calibration unaffected during wiring process.
- ★ Greater consistency.

2½ K.W. 200/250 V. AC only, single pole, single stage Energy Regulator fitted with side wiring terminals. Interchangeable with existing types.



2½ K.W. 200/250 V. AC only, single pole, single stage Energy Regulator fitted with rear wired terminals. The shallow rearward projection (1 19/32"), makes 1ER Energy Regulators extremely attractive to designers of modern electric appliances.





'DIAMOND H' SWITCHES LTD., GUNNERSBURY, AVENUE, LONDON, W.4.

TELEPHONE: CHISWICK 6444 (5 LINES) **TELEGRAMS AND CABLES: DIAMONHART, CHISK, LONDON**

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 25th November

BIRMINGHAM.—James Watt Memorial Institute, Great Charles Street, 6 p.m. I.E.E. South Midland Radio and Measurements Group. "Magnetic Materials," by Prof. F. Brailsford. (Joint meeting with Education Discussion Circle.)

CHESTER.—Town Hall, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "Earthing of Low- and Medium-Voltage Distribution Systems and Equipment," by F. Mather.

LEEDS.—Lighting Service Bureau, 24, Aire Street, 6.15 p.m. I.E.S. Leeds Centre. Ladies' evening, "New Light upon Cosmetics," by Miss Gallagher and Mrs. Naylor.

The University, 7.30 p.m. Incorporated Plant Engineers, West and East Yorkshire District. "Nuclear Reactors for Power Production," by J. A. Dixon.

LEICESTER. — E.M.E.B., Charles Street, 7 p.m. I.E.S. Leicester Centre. "Road Vehicle Lighting," by G. E. Charlesworth.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio and Telecommunication Section. Informal evening on "Problems of Sound and Television Broadcasting Coverage." Talk by G. Millington.

NEWCASTLE-UPON-TYNE. — Neville Hall, 6.15 p.m. I.E.E. North-Eastern Centre. "Electrical Equipment for Rectifier Locomotives," by H. B. Calverley, E. A. K. Jarvis and E. Williams.

NORWICH.—Assembly House, 7.30 p.m. I.E.E. East Anglian Sub-Centre. "Germanium and Silicon Power Rectifiers," by T. H. Kinman, G. A. Garrick, R. G. Hibberd and A. J. Blundell.

READING.—George Hotel, King Street, 7.15 p.m. I.E.E. District meeting. "Cathodic Protection," by J. H. Gosden.

SWANSEA.—South Wales Electricity Board, 6 p.m. I.E.E. Western Utilisation Group. "D.C. Winder Drives using Mercury-Arc Rectifier/Invertors," by L. Abram, J. B. McBreen and J. Sherlock.

Tuesday, 26th November

ARBORFIELD. — Unit Cinema, 3 (Tels.) Training Bn., R.E.M.E., 7 p.m. I.E.E. London Graduate and Student Section. District meeting. Film evening.

CARDIFF.—Angel Hotel, Westgate Street, 7.30 p.m. A.S.E.E. South Wales Branch. Film of the 1957 A.S.E.E. Exhibition.

COVENTRY. — G.E.C. Telephone Works, 7 p.m. I.E.E. South Midland Graduate and Student Section. "Recent Advances in Telegraphic Communication," by D. C. Tyler.

Electricity Sports and Social Club, Merrick Lodge, St. Nicholas Street. Coventry Electric Club. Two films: "The Great Jib," and "New Light on Industry."

GLASGOW.—Royal College of Science and Technology, George Street, 7 p.m. I.E.E. South-West Scotland Sub-Centre. "Servo-Operated Recording Instruments (A Review of Progress)," by Dr. A. J. Maddock.

HULL.—Yorkshire Electricity Board, Ferensway, 6.30 p.m. I.E.S. Leeds Centre. "Exterior Lighting at a Modern Airport," by J. Morse.

LEEDS.—C.E.A. Offices, 1, Whitehall Road, 7 p.m. I.E.E. North Midland Graduate and Student Section. "The Engineer as a Citizen," by J. R. Rylands.

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North Western Supply Group. "Earthing of Low- and Medium-Voltage Distribution Systems and Equipment," by F. Mather.

NEWCASTLE-UPON-TYNE.—City Hall, 7 p.m. I.E.E. North-Eastern Centre. Faraday Lecture, "The Electrification of the British Railways," by G. H. Fletcher.

RUGBY.—College of Technology and Arts, 6.30 p.m. I.E.E. Rugby Sub-Centre. "Transistor Circuits and Applications," by L. P. Morgan.

Wednesday, 27th November

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "Servo-Operated Recording Instruments (A Review of Progress)," by Dr. A. J. Maddock.

HANLEY.—Grand Hotel, 7.45 p.m. I.E.E. North Staffs. Graduate and Student Section. Senior chairman's address, by H. A. P. Caddell.

LONDON.—I.E.E. London Graduate and Student Section, 5.30 p.m. Visit to Hammersmith Hospital (research cyclotron).

At the Royal Institute of British Architects, Portland Place, W.1, 6 p.m. Illuminating Engineering Society. "Planning the Interior: the Expression of Current Ideas and Requirements," by P. Westwood.

Memorial Building, 76, Mark Lane, E.C.3, 5.30 p.m. Institute of Marine Engineers. "The Nuclear Propulsion of Ships," by Sir Christopher Hinton.

At the London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1, 6 p.m. British Institution of Radio Engineers. Annual general meeting, followed by "Transmission Standards and Signal Distortion in Television and Other Communication Systems," by Dr. A. van Weel, at 7.15 p.m.

At the Royal Institution, 2.30 p.m. Institute of Physics, London and Home Counties Branch. "The Design of Physics Research Laboratories."

PORTSMOUTH.—City Council Chambers, 6.30 p.m. I.E.E. Southern Centre. "The Measurement of Earth-Loop Resistance," by Dr. G. F. Tagg.

Wednesday, 27th November, to Friday, 29th November

LONDON.—Royal Horticultural Hall, S.W.1. British Institute of Radiology, Ninth Annual Congress. Exhibition of Equipment and Materials for use in Medical Radiology (organised by the British X-ray industry).

Thursday, 28th November

BATH.—S.W.E.B. Showroom, 7 p.m. I.E.E. Bristol Graduate and Student Section. Students' lecture. "Man-Machine Relationships," by W. H. Dunkley.

CROYDON.—Greyhound Hotel, High Street, 8 p.m. A.S.E.E. South London Branch. "Branch Lecturettes," by C. Hasler and H. T. Thorpe.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. "The Digital Computer Applied to the Design of Large Power Transformers," by W. A. Sharpley and J. V. Oldfield (Supply Section paper).

Connaught Rooms, W.C.2, 12.30 for 12.55 p.m. Batti-Wallahs' Society. Luncheon. Guest speaker, Mr. J. R. Rylands.

1, Birdcage Walk, Westminster, S.W.1, 6 p.m. Institution of Mechanical Engineers. "Some Aspects of Hinkley Point Project," by R. E. Zoller.

SHEFFIELD.—Grand Hotel, 7.30 p.m. Incorporated Plant Engineers, Sheffield and District Branch. "Factory Insulation—Its Place in the National Economy," by R. G. Hayes.

Friday, 29th November

BIRMINGHAM. — Imperial Hotel, Temple Street, 7.30 p.m. Incorporated Plant Engineers, Birmingham Branch. Ladies' evening. "Functional and Decorative Lighting in the Home," by A. Holden.

CHELTENHAM. — North Gloucestershire Technical College, 7 p.m. British Institution of Radio Engineers, South Midland Section. "Automatic Programming," by Dr. P. M. Woodward.

CLACTON-ON-SEA.—Royal Hotel. Ipswich and District Electrical Association. Ladies' night.

COVENTRY. — Craven Arms, 8.15 p.m. A.S.E.E. Coventry Branch. Films: "Capacitors" and "Capacitors in Industry."

LONDON. — Pepys House, 14, Rochester Row, Westminster, S.W.1, 7 p.m. Junior Institution of Engineers. Annual general meeting and annual meeting of contributors to the benevolent fund.

NEWCASTLE-UPON-TYNE. — King's College, 6.30 p.m. I.E.E. North Eastern Graduate and Student Section. "Electric Cable Making Materials—Testing and Application," by R. Hawley.

NOTTINGHAM. — Welbeck Hotel, Milton Street, 8 p.m. I.E.E. East Midland Centre. Dinner-dance.

WEYMOUTH.—South Dorset Technical College, 6.30 p.m. I.E.E. Southern Centre. "Equivalent Circuits of Transistors and their Application," by L. E. Jannson.

WOLVERHAMPTON. — I.E.S. Birmingham Centre. "Lighting of Educational Institutions," by J. R. Sheridan-Shedden.

Saturday, 30th November

BLACKPOOL.—Cliffs Hotel, 6.15 p.m. I.E.E. North Lancashire Sub-Centre. Dinner-dance.

GLASGOW.—Rhul Restaurant. Incorporated Plant Engineers, Glasgow Branch. Annual dinner-dance.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 30th November:—

SIMPLEX. No. 722,309. Class 7. Automatic washing machines for use in dairies; milking machines and parts; and vacuum pumps for use with milking machines.—Simplex Dairy Equipment Co., Ltd., Cintra House, 16, Hills Road, Cambridge.

SPARCARD. No. 765,768. Class 9. Scientific and electrical apparatus and instruments and parts.—Sparcatron, Ltd., Abbey Yard, Bath.

STEREOFLUID. No. 766,649. Class 9. Apparatus for converting mechanical vibrations into electrical vibrations; apparatus for converting electrical vibrations into mechanical vibrations; electric cables, transformers, connections, microphones and stands, and gramophone pick-ups; and parts. — "Ronette" Piezo-Electrische Industrie (Ronette p.e.i.), Amsterdam, Netherlands. Address for service, c/o F. J. Cleveland & Co., 29, Southampton Buildings, Chancery Lane, London, W.C.2.

No. 767,334 (design). Class 9. Muffles, retorts, crucibles and tubes, all for use in the metallurgical, glass, ceramic and the like industries; semi-conductors, surge arrestors (electrical apparatus), electrical resistors; and heating elements.—Carborundum Co., Ltd., Trafford Park, Manchester, 17.

CHRIMTORK. No. 767,410. Class 9. Electrically operated valves for automatically controlling the flow of liquid in pipe line systems, and parts.—Guest & Chrimes, Ltd., Don Street, Rotherham.

PANTAVOX. No. 768,553. Class 9. Telephonic apparatus and sound amplifiers.—British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C.2.

JACKSON-EGO. No. 764,561. Class 11. Electric cooking stoves and parts and fittings.—Jackson Electric Stove Co., Ltd., 7, Stratford Place, London, W.1.

VERITAS RADIANT. No. 765,925. Class 11. Heating installations and parts. — Falk, Stadelmann & Co., Ltd., Veritas House, 91, Farringdon Road, London, E.C.1.

MEMRAD. No. 768,085. MEMVEK. No. 768,086. Class 11. Heating and cooking apparatus and parts.—Midland Electric Manufacturing Co., Ltd., M.E.M. Works, Reddings Lane, Tyseley, Birmingham, 11.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Electricity Commission of New South Wales, Sydney. 23rd December. Two motor generator sets. (E.S.B. 27036/57. Ten/29132.)*

Blaydon (Co. Durham).—Blaydon District Industrial and Provident Society, Ltd. Electrical rewiring of central drapery department. Building manager.

Bristol.—Supply of electric cables and sundries for twelve months from 1st January, 1958. Central Purchasing Department, 2, Upper York Street, St. Pauls, Bristol.

Burma.—Burma Purchase Board, Rangoon. 28th November. Fourteen 37·5 kVA diesel electric generating sets. (E.S.B. 27461/57. Ten/29194.)* 2nd December. Meters, capacitors, transformers and equipment. (E.S.B. 27469/57. Ten/29197.)* Battery charging sets. (E.S.B. 27472/57. Ten/29212.)*

Canada.—Saskatchewan Power Corporation, Regina. 6th December. Electrical construction material for 1958. (E.S.B. 26805/57. Ten/29153.)*

Castle Ward (Northumberland).—R.D.C. Electrical installations in 16 houses at Whalton. G. E. Dimmack, surveyor, Council Offices, Ponteland.

Derby.—Corporation. 19th December. Trunk road lighting. (See this issue.)

Down.—County Education Committee. 5th December. Electrical installation in Annalong (new) Primary School, Annalong. J. R. W. Murland, consulting engineer, 13, Wellington Place, Belfast.

Formosa.—Central Trust of China, Taipei. 9th December. Automatic telephone switchboards. (E.S.B. 27481/57.I.C.A. Ten/29201.)* 13th December. Electric motors. (E.S.B. 27488/57.I.C.A. Ten/29195.)* Equipment for hydro-electric power station: 14th December. Power fuses, air break switches, insulators, relays, lightning arrestors, etc. 15th December. Galvanised steel angle, power cable, etc. 29th December. Power circuit-breakers and outdoor metal-clad switchgear. 30th December. Power and distribution transformers. 28th January. Steel penstock and accessories. (E.S.B. 27483/57. I.C.A. Ten/29202.)*

Guatemala.—Servicio Cooperative Interamericana de Agricultura, La Aurora. 31st March. Building supplies, including insulated wire and electrical equipment. (E.S.B. 26786/57.I.C.A. Ten/29104.)*

India.—Director General of Supplies and Disposals, New Delhi. 5th December. Paper insulated cable. (E.S.B. 27186/57. Ten/29182.)* 10th December. Zinc elements for A.D. conversion cells. (E.S.B. 27189/57. Ten/29207.)* 15th January. One 34,000 h.p. Francis turbine with one 23,000 kVA waterwheel driven a.c. generator. (E.S.B. 26750/57. Ten/29110.)*

Iraq.—Directorate General of Municipalities. 30th November. 200,000 electric lamps. (E.S.B. 27118/57. Ten/29151.)*

Korea.—Government Office of Supply, Seoul. 3rd December. Radio telephone systems, telegraph and miscellaneous test equipments. (E.S.B. 27199/57. Ten/29188.)*

London.—India Store Department. Spares for wireless set No. 62. (See this issue.)

New Zealand.—G.P.O., Wellington. 12th December. Switches. (E.S.B. 27536/57. Ten/29214.)* 13th December. Frequency meters. (E.S.B. 27142/57. Ten/29162.)*

Philippines.—National Power Corporation, Manila. 3rd January. One 69,000 h.p. hydraulic turbine, with inlet valve and oil pressure governor for the Maria Cristina Unit No. 3 hydro-electric project at Mindanao. (E.S.B. 26893/57. Ten/29071.)*

South Africa.—Stores Department, South African Railways, Johannesburg. 4th December. Electric locomotive motor coach cable. (E.S.B. 26911/57. Ten/29096.)* 13th December. Battery charging equipment. (E.S.B. 27073/57. Ten/29135.)* Electric cable. (E.S.B. 27072/57. Ten/29136.)*

Union Tender and Supplies Board, Pretoria. 28th November. Telephone switchboard pegs. (E.S.B. 27062/57. Ten/29146.)* 5th December. Thermostatic switches. (E.S.B. 26985/57. Ten/29134.)* Wiring buckle clips. (E.S.B. 26992/57. Ten/29106.)*

City Treasurer's Department, Johannesburg. 5th December. Traffic signal cable. (E.S.B. 27399/57. Ten/29211.)*

Torpoint.—U.D.C. 14th December. Group "A" street lighting equipment. (See this issue.)

United States.—Bureau of Reclamation, Denver. 4th December. Main control board and supervisory control telemetering and carrier telephone equipment. (E.S.B. 26204/57. Ten/29140.)*

Uruguay.—Administracion General de las Usinas Electricas y los Telefonos del Estado. 17th December. Automatic telephone exchange. (E.S.B. 26759/57. Ten/29098.)* 18th December. Telephone cable and wire. (E.S.B. 26758/57. Ten/29089.)*

ORDERS PLACED

Barking.—Corporation. Recommended. Street lighting programme (£6,209).—G.E.C.

Birkenhead.—Markets and Abattoir Committee. Recommended. Rewiring of Market Hall (£7,620).—Frank Hancock (1939), Ltd.

Leek (Staffs).—Birmingham Regional Hospital Board. Recommended. Rewiring work (Phase V) at St. Edward's Hospital, Cheddleton (£7,984) and renewal of electricity cable to staff houses, also at the St. Edward's Hospital, Cheddleton (£1,799).—E. Holloway.

Shrewsbury.—Birmingham Regional Hospital Board. Recommended. Rewiring work at the Shelton Hospital, Shrewsbury (£20,120).—T. Wood & Sons (Chester), Ltd.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Belfast.—Houses (563), 10 flats, 40 maisonnettes, 14 old people's dwellings and six shops, Turf Lodge site; housing architect, 94, Chichester Street.

Birmingham.—New admission hospital and out-patients' department for Rubery and Hollymoor Hospitals (£540,000) and modernisation of Summerfield Hospital (£174,000); Birmingham Regional Hospital Board, 10, Augustus Road, Edgbaston, 15.

Blyth.—Welfare home (£29,000); county architect, County Hall, Newcastle-on-Tyne.

Bristol.—Works rebuilding; Mardon, Son & Hall, Ltd., Temple Street.

Bury St. Edmunds.—Extensions to Silver Jubilee School (£50,000); West Suffolk county architect, 13, Westgate Street, Bury St. Edmunds.

Carshalton.—Second stage development of Technical Institute (£149,700); Surrey county architect, County Hall, Kingston-on-Thames.

Chelmsford. — Fire station (£40,000); county architect, County Hall, Chelmsford.

Cheshunt.—Factory for Bagshaw & Morris, Ltd.; Allen Fairhead & Sons, Ltd., builders, Sydney Road, Enfield.

Croydon.—Factory, King Henry's Drive, Addington; Siggs & Chapman, Ltd., Tithe Barn Works, Purley Way.

Dwellings (98), Godric Crescent; K. A. Hawkes, Ltd., builders, Minnis Road, Birchington.

Exeter.—Works extensions; S. R. Force & Sons, Ltd., 15/17, Sidwell Street.

Gravesend.—Maisonnettes and flats (104), Park Place; borough surveyor.

Kettering.—Eight-storey block of flats; Gotch, Saunders & Surridge, architects, Bank Chambers, High Street.

Kilmarnock.—Offices, Burnside Street (£80,000); Blackwood, Morton & Sons, Ltd., 99, Glasford Street, Glasgow, C.1.

Houses (230), Bellfield; burgh surveyor, 11, London Road.

King's Langley.—Secondary modern school (£142,824); C. H. Aslin, Herts county architect, County Hall, Hertford.

Liverpool.—Physiotherapy department at Walton Hospital; Liverpool Regional Hospital Board, 88, Church Street.

Houses (108), Skirving Street; city architect.

London.—Flats and maisonnettes (61), Meyrick Road, Battersea; borough engineer.

School of English, Goodge Street, St. Pancras, for Sir Isaac Pitman & Sons, Ltd.; Wm. Moss & Sons, Ltd., contractors, North Circular Road, N.W.2.

Dwellings (102), Kingsland and St. Mary's estates, Shoreditch; Tersons, Ltd., builders, 4, Dollis Park, N.3.

Maternity, child welfare and school treatment centres at Hallfield, for Paddington B.C.; Cyril Sweett, quantity surveyor, 48, Bedford Row, London, W.C.1.

Scheme for the acquisition of Alexandra Theatre, Stoke Newington, and erection on site of offices with 28 flats over; borough engineer, Church Street, N.16.

Houses (162), as development of the Presburg Street site, Hackney; D. Sorrell, town clerk, Town Hall, London, E.8.

Plymouth.—Civic Centre; G. A. Jellicoe & Partners, architects, 12, Gower Street, London, W.C.1.

Redcar.—Houses (137) and bungalows (30), Green Lane housing estate; Needham, Thorp & White, Council's architects, 5, High Petergate, York.

Wallsend.—Research laboratory, Stephenson Street, for Associated Lead Manufacturers, Ltd., Crescent House, Newcastle-on-Tyne; own architect.

Factory additions for Commercial Plastics, Ltd., Stephenson Street; H. & M. Gatoff, architects, 51, Grainger Street, Newcastle-on-Tyne.

Factory additions, North Terrace; Victor Products.

West Bromwich.—Church hall, Yew Tree estate; Jennings, Homer & Lynch, architects, Church Street, Brierley Hill.

Whitley Bay.—Extensions to Rex Hotel, Promenade; T. W. Grey & Co., builders, Front Street, Tynemouth.

Wimbledon.—Extensions and adaptations at Pelham County Girls' School (£34,072); Surrey county architect, County Hall, Kingston-on-Thames.

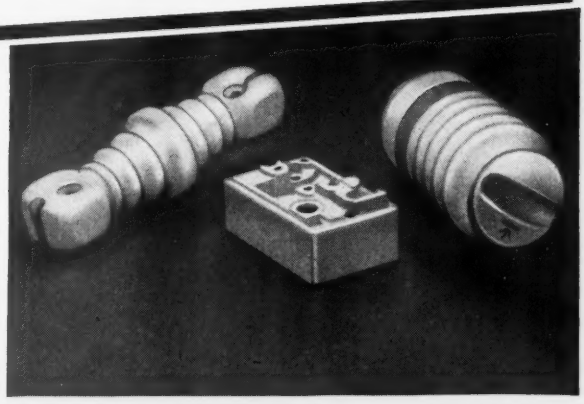
Worthing.—Extension of Central Public Library; Goldsmith & Pennells, architects, 13, Liverpool Gardens.

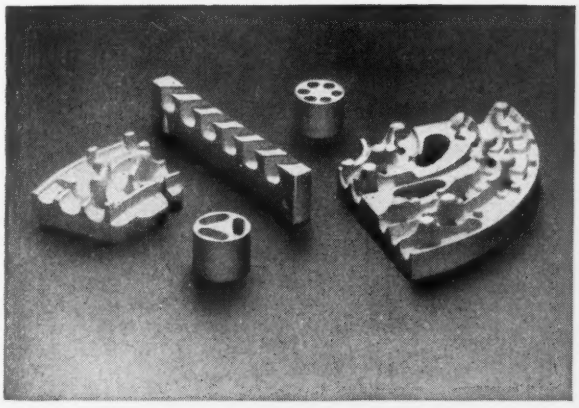
Three-storey block of shops and offices, Chapel Road; Brighton, Worthing & District Property Co., Ltd., 14, Grand Parade, Brighton.

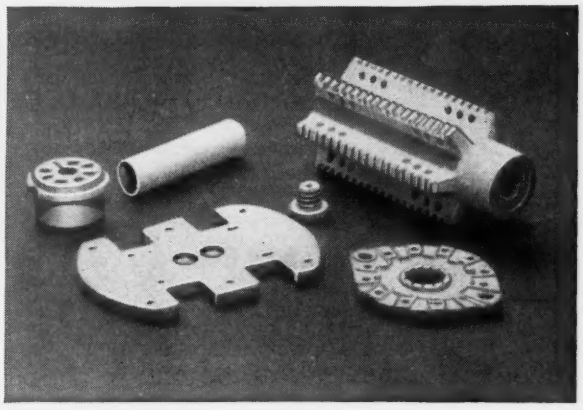
* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

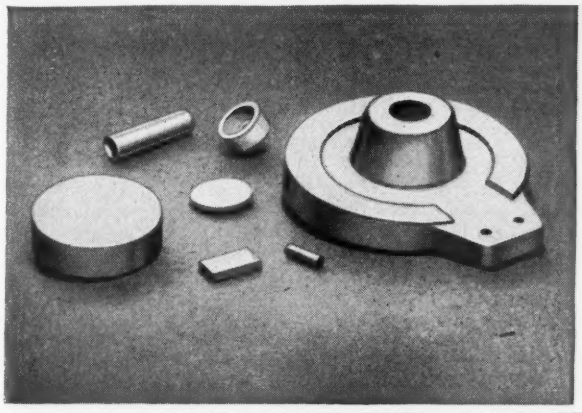
Bullers CERAMICS
FOR INDUSTRY

High quality material and dimensional precision are attributes of Bullers die-pressed products.
Prompt delivery at competitive prices.









We specialise in the manufacture of

PORCELAIN
for general insulation

REFRACTORIES
for high-temperature insulation

FREQUELEX
for high-frequency insulation

PERMALEX & TEMPLEX
for capacitors

9LI2A

BULLERS LIMITED
MILTON · STOKE-ON-TRENT · STAFFS
Phone: Stoke-on-Trent 21381 (5 lines) · Telegrams & Cables: Bullers, Stoke-on-Trent
Ironworks: TIPTON, STAFFS Phone: Tipton 1691
London Office: 6 LAURENCE POUNTNEY HILL, E.C.4 Phone: MANsion House 9971

KELVIN D.C. RESISTANCE BRIDGE

PATT. No. 12262

WITH this bridge D.C. resistance may be measured quickly and accurately from 0·000001 to 10 ohms. The accuracy is not seriously affected by contact resistance between bridge and test piece or by fluctuations in supply current.

The resistance value is read on two dials, one of ten 0·01 ohm steps, the other of 0·012 ohms continuously variable—one scale division representing 0·0001 ohm. This range is extended by a seven position multiplying switch.

Pattern No. 12262 A. With multipliers X10, X5, X1, X0·5, X0·1, X·05, X·01. Overall range 0·000001 to 1 ohm.

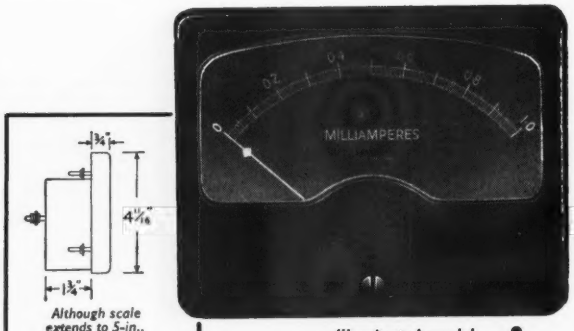
Pattern No. 12262 B. With multipliers X100, X50, X10, X5, X1, X0·5, X0·1. Overall range 0·00001 to 10 ohms.

These models include a taut suspension reflecting galvanometer with sensitivity control, and a two-dial current control with ammeter. The maximum current rating is 25 amperes continuous.

GAMBRELL BROS. & CO. LTD.

105/107 Lansdowne Road, Croydon, Surrey
Telephone : CROYDON 8282

A new 6-inch rectangular moving coil instrument...



Although scale extends to 5-in., body diameter is only 3¼-in.

Illuminated model

This new instrument is available either in **illuminated** model (effected internally) with black dial and white scale and pointer, or **non-illuminated** with white dial and black scale and pointer. It can be provided in either B.S.S. 89, 1954 Industrial or Precision Grade accuracy. The two Pea lamps employed for illumination are easily replaced from the front.

SIFAM

Available as D.C. or A.C. Rectifier; Voltmeters, Ammeters, Milliammeters and Microammeters, or as H.F. Thermocouple: Ammeters and Milliammeters.

Write to : **SIFAM ELECTRICAL INSTRUMENT CO. LTD.**
LEIGH COURT — TORQUAY — Telephone 4547/8

TRANSFORMERS of all types up to 25 kVA for Single or Three Phase operation, Phase Conversion, etc.

INDUCTA

COILS for Contactors, E.M. Brakes, Air Valves, etc. and COIL WINDINGS for all purposes.

MAINS Output, and Special Purpose Transformers for Radio Equipment, Chokes, etc.

SOLENOIDS for A.C. and D.C. Operation A.I.D. APPROVED

W. F. PARSONAGE & Co LTD
INDUCTA WORKS
PARK RD BLOXWICH WALSALL
TELEPHONE: BLOX. 66464

ELECTRICAL CONTRACTORS

LOW VOLTAGE INSTALLATIONS

We are now supplying installation materials for our well-known Low Voltage Overhead Grid System for Portable Inspection Lamps for your own erection. If desired, we are still glad to sub-contract for Low Voltage side of installation. Send for descriptive Brochure and price-list of our Rod Lamp Assemblies, Inspection Lamps only and **special Rough Service Low Voltage Bulbs,** whether for Overhead Grid system or for use with wall plugs—Quotations for Grid materials and Transformers to requirements.

Avoid trouble by refusing inferior copies of our Lamps or System.

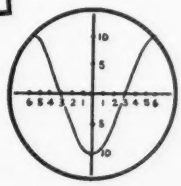
KELVIN NORTON ELECTRIC CO. LTD.
25 BARBAULD STREET, WARRINGTON
LANCASHIRE. TEL.: WARRINGTON 31925

Frequency Changers

FOR 400 CYCLES POWER SUPPLIES

200/115 volts 3 phase output

1 K.V.A. Frequency Changer. Input: 415 Volts; 3 Phase; 50 Cycles. Output: 200 Volts; 3 Phase; 400 Cycles.



Good inherent voltage and frequency regulation, and negligible harmonic content in the voltage wave-form.

Scientific Research Laboratories, Aircraft Applications, and other equipment calling for a high degree of electrical performance.

Enquiries welcomed for any type of special purpose rotating electrical equipment.

VERNONS INDUSTRIES LIMITED

KIRKBY TRADING ESTATE KIRKBY, LIVERPOOL · Tel. SIMonswood 3261

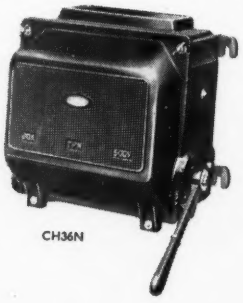
'CH' FUSED SWITCHES

DENNIS TYPE 'H'

STANDARD PATTERNS

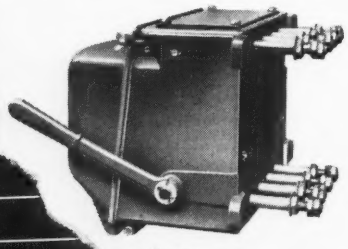
FRONT CONNECTED PATTERN SWITCHES

The normal standard type is known as the front connected pattern and is for use as a loose unit or for mounting above or below ducts or busbar Chambers. The catalogue prefix is "CH" or "CS" according to whether the switch is fused or not.



CH36N

BACK CONNECTED PATTERN SWITCHES

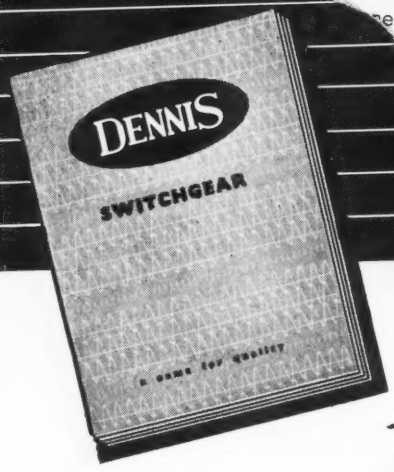


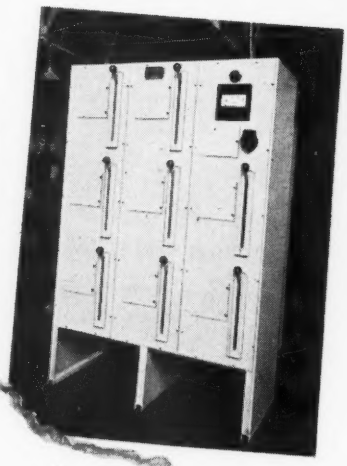
CH320N/B

This pattern is the standard switch provided with insulated screwed stems protruding through the back of the switch complete with locknuts. This type is for mounting on the front of cubicles so that connections of either cable or solid copper can be made to the back of the switch inside the cubicle. The catalogue prefix is CH—/B or CS—/B.

...NEL MOUNTING SWITCHES

...ew development enabling us ... switchboards incorporating ... economical prices, and ... completely flush fronted ... appearance. Our ... a steel panel ... protruding ... by a cast ... shutter to ... operat- ... ith





Take a leaf from the Dennis "book"

DENNIS

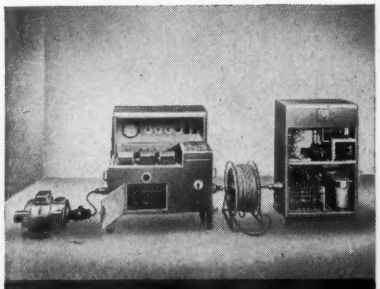
All users of electrical switchgear, Contractors and Wholesalers, should keep a copy of the Dennis Catalogue, M.C.4, handy for constant reference. This gives comprehensive information of the full range of Dennis Switchgear which is readily available to meet the everyday demands of the Electrical Engineer.

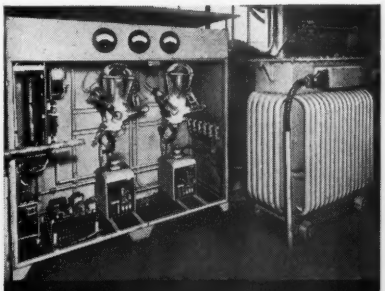
G. P. DENNIS LIMITED SPEKE LIVERPOOL *Telephone: Hunts Cross 2241 (5 lines)*

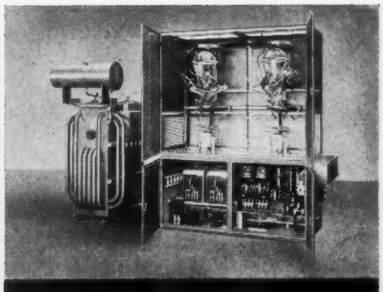
LONDON OFFICE: 417 GRAND BUILDINGS · TRAFALGAR SQUARE · LONDON W.C.2

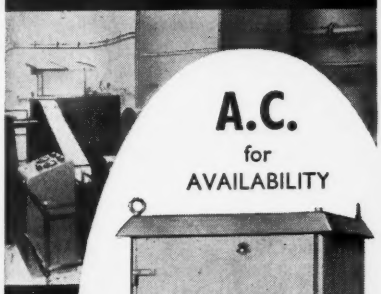
CVS-29

Speed up PRODUCTION AND PROCESSING . . .

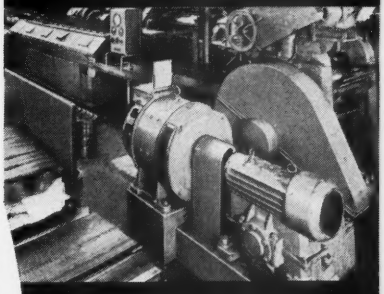

TEST RIGS

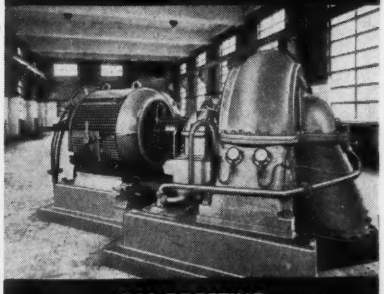

CONVEYORS


WIRE DRAWING



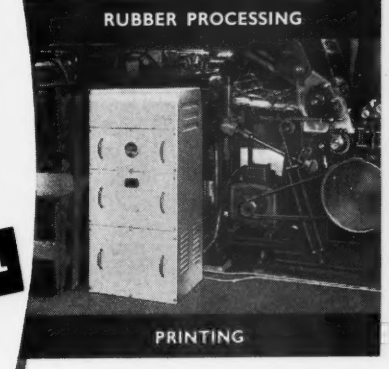
A.C. for AVAILABILITY

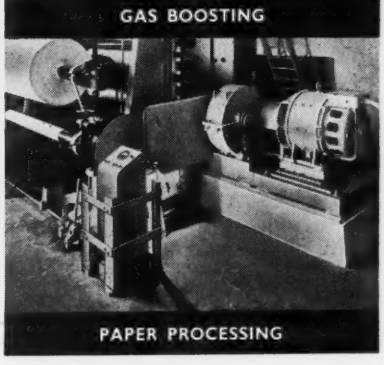

RUBBER PROCESSING


GAS BOOSTING

FINGER-TIP CONTROL

D.C. for MAXIMUM FLEXIBILITY


PRINTING


PAPER PROCESSING

with **VARIONIC**

VARIABLE SPEED DRIVES

The Varionic drive can provide manual or automatic speed control between 1 HP and 1000 HP over a wide range of speed. It has a high efficiency, requires the minimum of maintenance and compares favourably on initial cost.

Write for Publication NV.200

LANCASHIRE DYNAMO NEVELIN LTD

(RECTIFIER DIVISION)

HURST GREEN, OXTED, SURREY · TELEPHONE: OXTED 3361 · TELEGRAMS: NEVELIN OXTED

NR11

METERS

To B.S. 89 Calibrated and Scaled to your requirements

COMPREHENSIVE RANGE AVAILABLE EX-STOCK or TO ORDER

DELIVERY 7-14 DAYS

Stockists of:
ERNEST TURNER, BALDWIN EAC, WEIR and LEADING MANUFACTURERS INSTRUMENTS

MOVING COIL, MOVING IRON, THERMO COUPLE, ELECTROSTATIC

CIRCULAR (Flush or Projecting), SQUARE, RECTANGULAR and INDUSTRIAL PATTERNS

Typical 2½" and 3½" Round Flush Pattern.

We can supply meters with Non-Standard Current and Voltage Ranges to any specification.

Owing to increased capacity we are now able to accept customers' own Meters for SCALE DRAWING & LETTERING

Manufacturers of:
ELECTRONIC TEST EQUIPMENT, NETWORK ANALYSERS, EDUCATIONAL GEOPHYSICAL and SPECIAL INSTRUMENTS, PORTABLE MULTIRANGE TEST SETS at 1 megohm per Volt.

May we quote for your requirements?

ANDERS ELECTRONICS LTD.
103 HAMPSTEAD ROAD, LONDON, N.W.1
Telephone: EUSton 1639

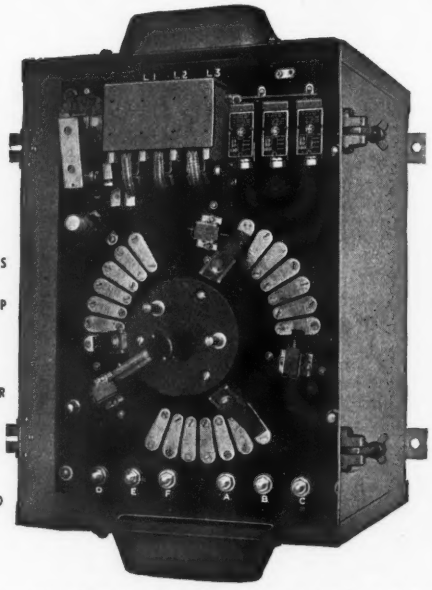
Suppliers to Govt. Depts., B.C.C., Tech. Colleges, Leading Manufacturers & Research Laboratories

'KENBAR' ELSTREE CONTROLS

COMBINED STARTER REGULATORS WITH START-INCH-STOP PUSH BUTTON CONTROL

PRE-SET CONTACTOR CONTROL PANELS FOR THE PRINTING TRADE

STAR DELTA AND SERIES PARALLEL STARTERS



HAND OPERATED THREE PHASE STARTERS FOR SLIP RING MOTORS UP TO 35 H.P. 400 VOLTS

LEAFLET No. 5b

SEND YOUR ENQUIRIES TO:

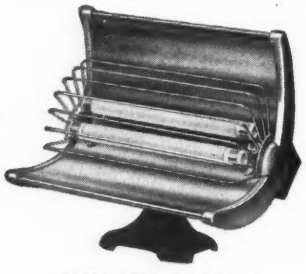
KENBAR ELECTRICAL CO. LTD.

ESTABLISHED OVER 35 YEARS

FORSYTH RD · SHEERWATER · WOKING · SURREY

Phone: WOKING 5060 Grams: Amperage, Woking

THE POPULAR **FOUR-TEN** MODEL REFLECTOR FIRE *WITH THE LONG-LIFE ELEMENT*



AVAILABLE IN 1-BAR and 2-BAR SIZES

Please write for catalogue and prices

ELECTROWAY HEATERS LTD

LOUGHBOROUGH, LEICS. *Telephone:* **4381** (2 *lines*)

If you need

a small **METAL PRESSING** for your product, why not consult us?

We specialise in light precision presswork in all metals for the Electrical Trades.

QUOTATIONS BY RETURN

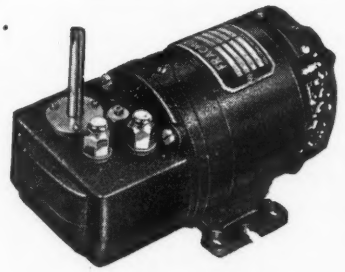
BIRMINGHAM SPECIALITIES LTD.
80-81 Bath Street, Birmingham 4. *Phone: CENTRAL 2492*

small wonder . . .

The very wide range includes:

★ UNIVERSAL 1/250 to ¼ h.p.
★ SINGLE, SPLIT PHASE 1/100 to ¼ h.p. and CAPACITOR 1/80 to 1/6 h.p.
★ 3-PHASE 1/20 to 1/3 h.p.
★ SYNCHRONOUS 1/100 to 1/16 h.p.
★ SHADED POLE 1/60 h.p. at 1,300 r.p.m.
★ GEARED UNITS 0.125 to 600 r.p.m. Torque up to 850 lbs/ins.

Our vast resources and many years of wide and practical experience are available to you. Consult us first — and be sure of success!



● Illus.: Type 334C40 Geared Motor, with A.C. and D.C. interchangeable frames 1-20 r.p.m. Torque: 20-10 lbs/ins.

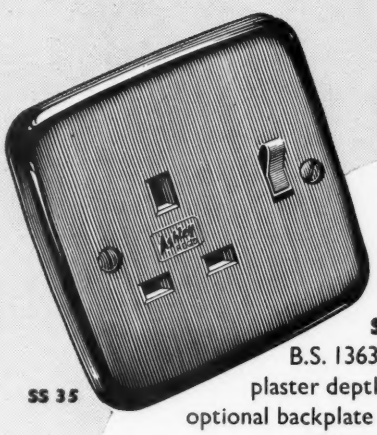
FRACMO does a big job!

FRACTIONAL H.P. MOTORS LTD
Rookery Way · Hendon · NW9 · Phone: COLindale 8022/4

Also 6 Lansdowne Road, Erdington, Birmingham 24 Phone: Erdington 0460

DAF 314

Ashley REGD 13 AMP. RING CIRCUIT ACCESSORIES

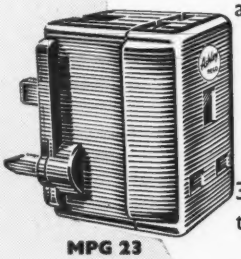


SS 35

J 401

SOCKETS & SWITCHSOCKETS. B.S. 1363 & 2814. Brown or Cream. Flush, for plaster depth or deep socketboxes. Surface, with optional backplate I.E.E. 207G. Safety shuttered. Quiet switch, silver contacts, nylon pad.

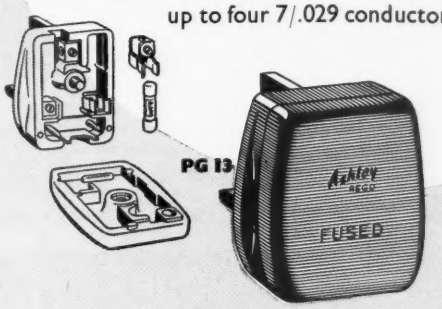
FUSED PLUG. B.S. 1363. Brown or Cream. Block terminals. B.S. 1362 Cartridge Fuse-Link, 13 Amp. supplied, 10, 5 or 2 Amp. also available. Optional, High Impact resistant type, Black.



MPG 23

SOCKET ADAPTOR. Complies I.E.E. 611(a). Brown or Cream. Safety shuttered twin outlets. B.S. 1362 13 Amp. Cartridge Fuse-Link.

SELECTIVE ENTRY SPUR BOX (Pat.). B.S. 816 3½" dia. x 1¼" x 2" fixing centres. Four cable entries, those unused closed by shutters integral with cover. Three block terminals each taking up to four 7/.029 conductors.



PG 13

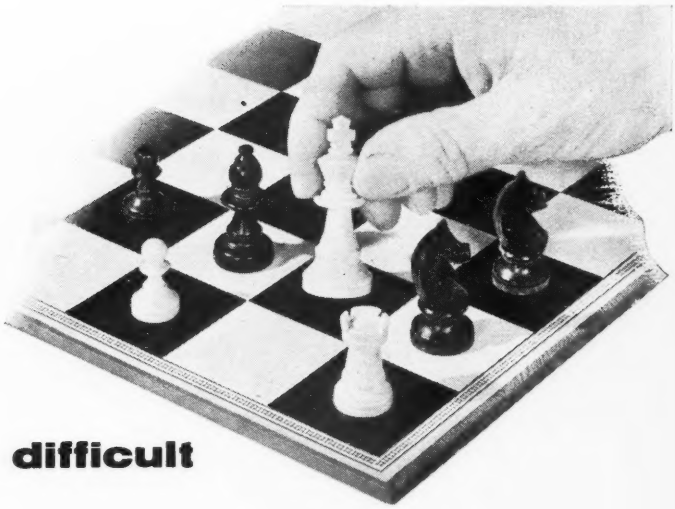
SK 31

Literature and technical service, with pleasure.

Ashley REGD.

ASHLEY ACCESSORIES LIMITED, ULVERSTON, LANCASHIRE
Telephone: Ulverston 3333 *Telegrams:* Ashley, Ulverston
MEMBER OF THE ASHLEY GROUP

AY 102



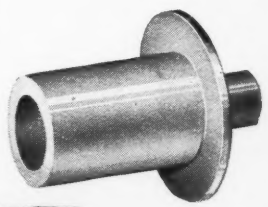
The choice is often difficult

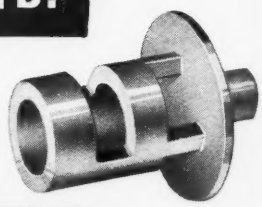
Take the matter of Die Castings vs. Hot Pressings. Each method has its own advantages for producing dimensionally accurate components.

DIE CASTINGS in Brass, Bronze or Aluminium, cut costs by the reduction of machining and finishing operations and by the virtual elimination of machining allowances.

BRASS PRESSINGS, again, can be produced so rapidly that, in many cases, the nett unit cost is lower by this method than any other.

The problem, therefore, is to choose the most suitable and economical process for YOUR specific needs. And that is where we at the Non-Ferrous Die Casting Company can help: we can advise you well for we make *both* . . . Together with our associate company, Brass Pressings (London) Ltd., we conduct joint operations under one roof, sharing administrative and technical personnel, and the same metallurgical laboratories. Our recommendations to you are therefore sound and unbiased.





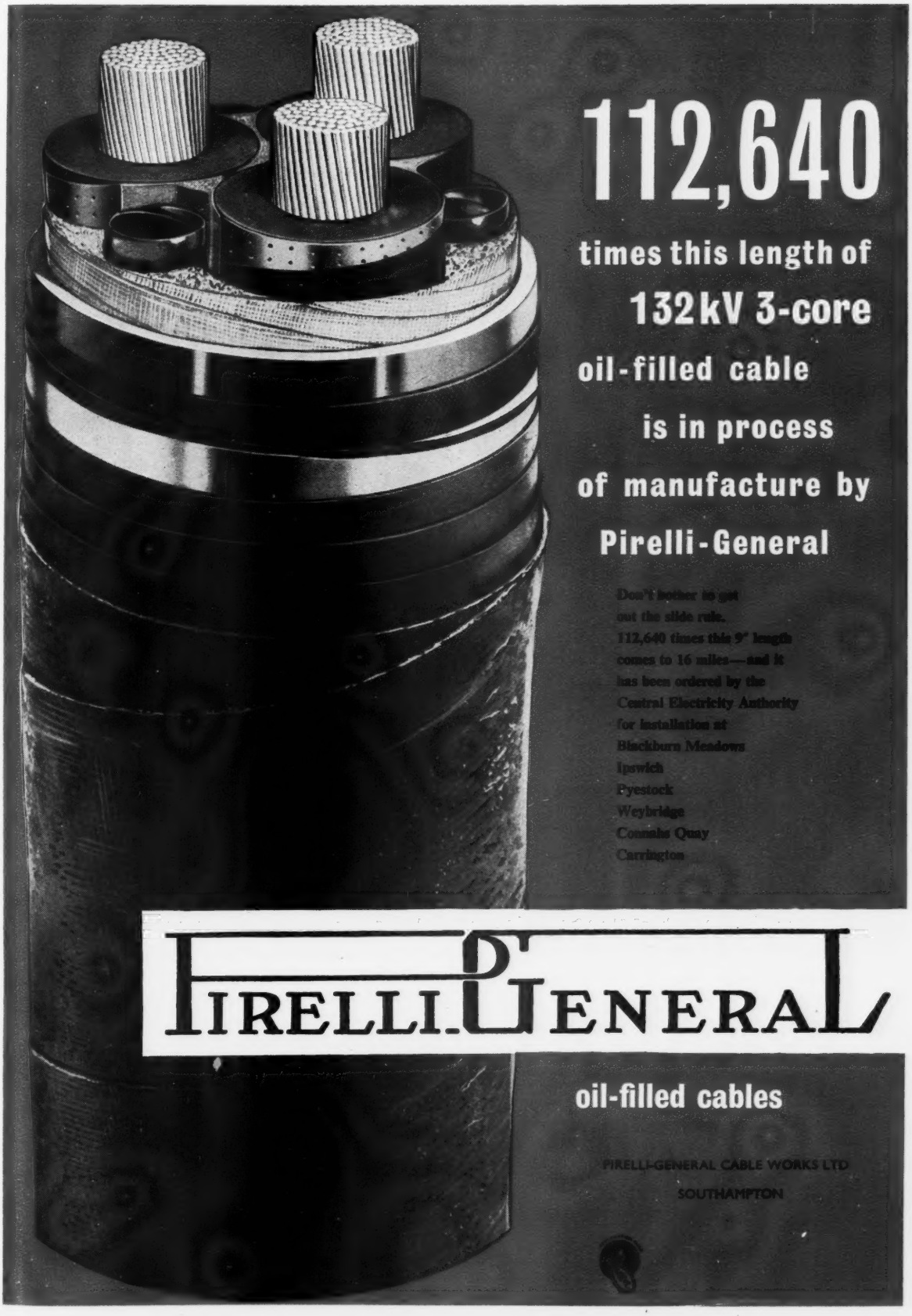
BRASS PRESSINGS (LONDON) LTD.

Remember, whenever you require a constant or phased supply of dimensionally accurate parts in Brass, Bronze or Aluminium — contact us *first*. Should you wish, we will be pleased to send a Technical Representative to discuss your problem.

THE NON-FERROUS DIE CASTING CO., LTD.

Nonferdica Works, North Circular Road, London, N.W.2. Telephone: GLAdstone 6377

45


112,640
times this length of
132kV 3-core
oil-filled cable
is in process
of manufacture by
Pirelli-General
Don't bother to get
out the slide rule.
112,640 times this 9" length
comes to 16 miles—and it
has been ordered by the
Central Electricity Authority
for installation at
Blackburn Meadows
Ipswich
Pyestock
Weybridge
Connahs Quay
Carrington
PIRELLI GENERAL
oil-filled cables
PIRELLI-GENERAL CABLE WORKS LTD
SOUTHAMPTON

make a note of it . . .

JEARY for GEARED MOTORS

Specialists in Geared Motors and Fractional H.P. Motors

- CRABTREE MOTOR CONTROLLERS
- M.E.M. SWITCHGEAR AND STARTERS
- FANS—PROPELLERS AND AXIAL FLOW INCLUDING FLAME-PROOF

JEARY
ELECTRICAL COMPANY LTD.

Successors to: G. Braulik (Est. 1887)

Main Stores: 132/142 EAST ROAD, LONDON, N.1. *Telephone: CLErkenwell 4141*

Fire alarms

manual or automatic contacts, for large or small premises- we contract for installations or supply equipment.

Write for catalogue to

ASSOCIATED FIRE ALARMS LTD.
Claremont Road, London, E.17
LARkswood 8373/4
Branches throughout Great Britain

THE LONGEST EXPERIENCE — AFA — PLUS THE MOST UP-TO-DATE EQUIPMENT

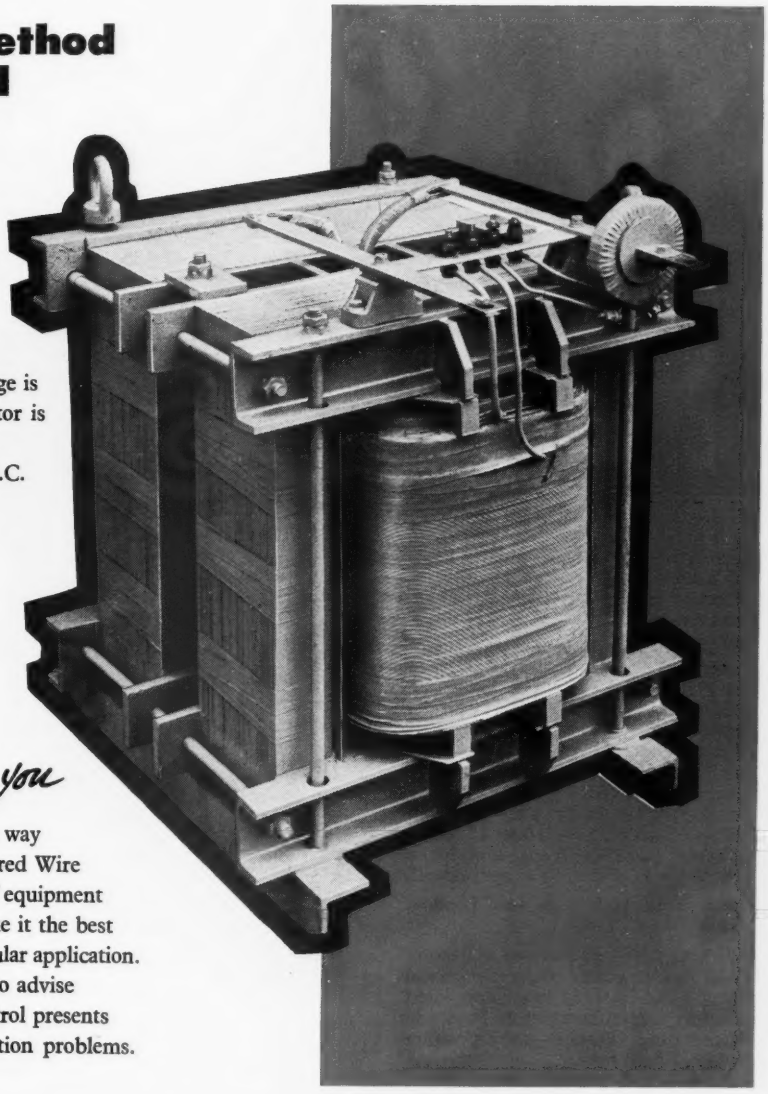
A.F.75

BRENTFORD

Now introduce Transductor Equipment

an alternative method of voltage control

In addition to their well-known Bared Wire Voltage Regulator, Brentford now have available a range of Transductor Equipment.
The Transductor shown in the photograph is rated for 35 kVA, and is designed to control the temperature of a furnace. Manual adjustment of the voltage is obtained by a rheostat and the Transductor is supplied complete with all the necessary equipment, including a rectifier for the D.C. winding.



automatic control

Brentford can arrange for the Transductors to be controlled automatically from a suitable voltage sensitive device, or from any other reference source.

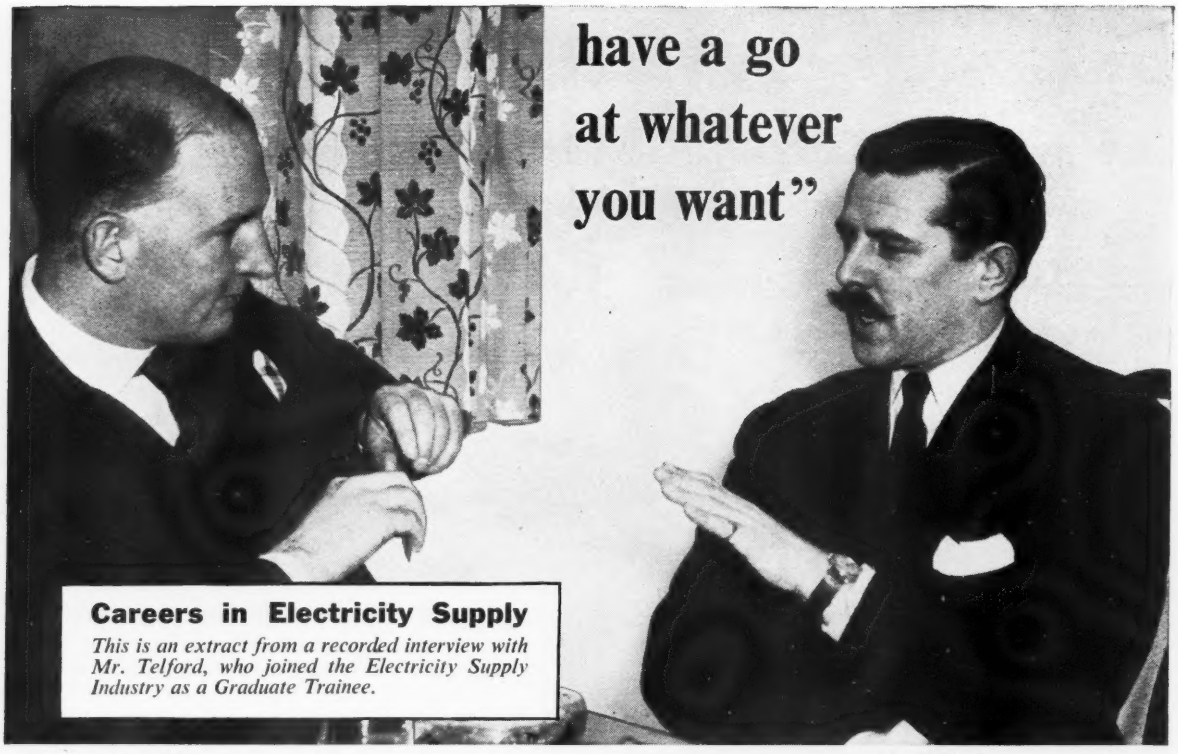
Let Brentford advise you

The introduction of Transductors is in no way intended to supersede the conventional Bared Wire Brentford Regulator, because each type of equipment possesses certain characteristics which make it the best suited to meet the requirements of a particular application. In this respect, Brentford will be pleased to advise customers regarding which method of control presents the best solution for their voltage regulation problems.

BRENTFORD FOR REGULATION

BRENTFORD TRANSFORMERS LTD., MANOR ROYAL, CRAWLEY, SUSSEX. TELEPHONE: CRAWLEY 25121

"...you can have a go at whatever you want"



Careers in Electricity Supply

This is an extract from a recorded interview with Mr. Telford, who joined the Electricity Supply Industry as a Graduate Trainee.

C.E.A. Question Master — *Mr. Telford.*

Question Master: **I think we might begin by asking what was your first job in Electricity Supply after your training was finished?**

Mr. Telford: Well, my training was interrupted by the war, and it was only in 1950 that I finished my graduate course in the industry. I was then appointed Shift Charge Engineer at Frome, Somerset—a small station but an excellent training ground. From there I went to Earley—a much bigger station of 120 megawatts—as Boiler House Shift Engineer; later I became Charge Engineer there, and for a while was Efficiency Engineer, as well.

Q.M.: **Your next step was London, wasn't it?**

Telf: Yes, I came to London as Second Assistant Engineer on the Divisional Staff, and later I was appointed Deputy Superintendent at Bankside Generating Station—the position which I hold now.

Q.M.: **Bankside is a pretty big station, and at 36 you're young, aren't you, to be a Deputy Superintendent? But what made you come to London in the first place?**

Telf: A chance came along to get some administrative experience at H.Q. level, and I thought I'd better take it.

Q.M.: **Does the Industry give many opportunities like that?**

Telf: It most certainly does. It gives you a complete opportunity to have a go at whatever you want, and what you think you're best equipped for. The man who wants to get on is helped in every possible way; I've attended several courses run by the Authority, not only on technical matters, but on subjects like personnel selection and industrial relations.

Q.M.: **You find your job gives you scope for managerial ability—dealing with people as well as machines?**

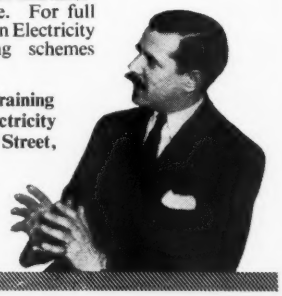
Telf: Yes, indeed. I don't think there are many better opportunities than in a power station, because you have something of everything. You have the mechanical side, the electrical side, the building side—and most of all, a number of people with varied interests and jobs.

Q.M.: **Now a word about newcomers to the industry. If you have a chap of ability who is prepared to get down to the task, what would you say his opportunities were like?**

Telf: I would say that he has really splendid opportunities. For one thing, a career in the industry is established on a very firm footing—you could do without a lot of things, but it's impossible to get on nowadays without electrical energy. Another point worth remembering is that a man coming into the industry has the choice of the entire country to work in—England, Scotland and Wales—and there's no parochial approach.

We'd like to publish more of this interview, but there isn't space. For full details of the many careers in Electricity and the salaried training schemes available, please write to:

The Education and Training Officer, Central Electricity Authority, 12 Winsley Street, London, W.1.



I'm the Modern Genie of the Ring

Here's all about myself—

I can . . . answer the bell, deal with callers, open the door—but only to the right people! be porter, caretaker or even a Doctor's or Dentist's receptionist;

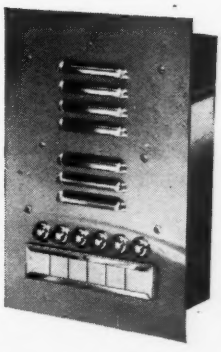
Most important of all I'm on duty 24 hrs. a day *every day of the year* —no sickness, absenteeism or holidays for me!

You'll find me invaluable in large blocks of flats, converted houses, in fact EVERYWHERE where there's a door-keeping problem.

My name?

The STERDY PORTER SYSTEM

P.S. You can hire or buy me. If you'd like to know more write to or telephone—



EST. STERDY 1920 TRADE MARK

W. C. DAVEY & COMPANY

180-182 Tottenham Court Road, London, W.1
Telephone: MUSeum 4414, 4415 and 6388

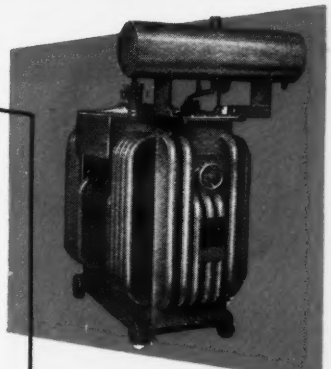
HIGH STREET GUILDFORD

We make good transformers quickly at Guildford

Up to 500kVA

TRANSFORMERS

- ★ Distribution
- ★ Electronic Equipment
- ★ Rectifiers
- ★ H.F. Heating
- ★ Low Voltage Supplies
- ★ Welding
- ★ Furnaces, etc.



RECTIFIERS

- ★ Battery Charging
- ★ D.C. Motors
- ★ General Power Supplies
- ★ Engine Starting
- ★ Welding, Etc.

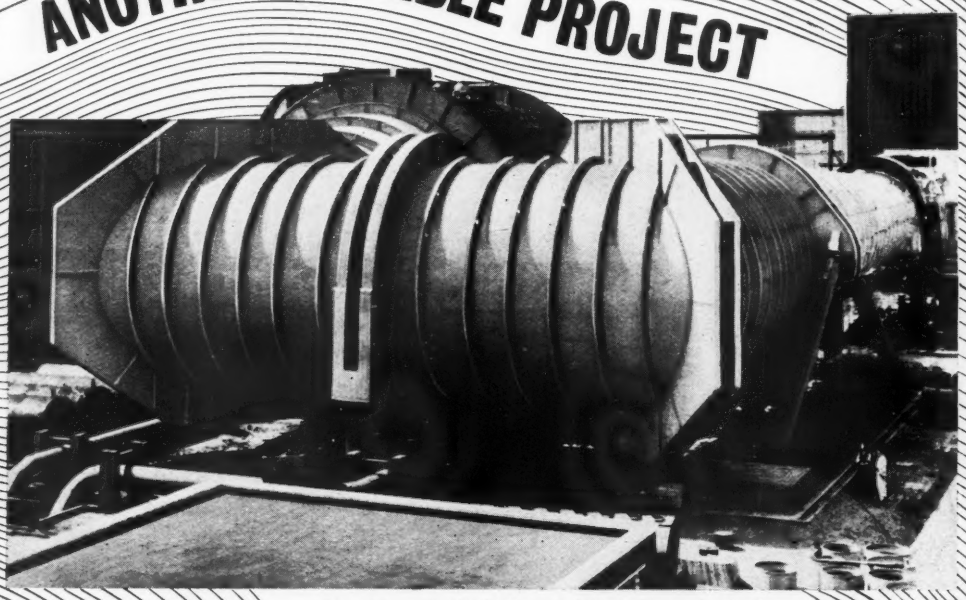
Up to 100kW

You can depend on—

TRANSFORMERS & RECTIFIERS LTD.

Dept. E.I.
MILLMEAD · GUILDFORD · SURREY
Tele: Guildford 66764 *Grams: Transrect, Guildford*

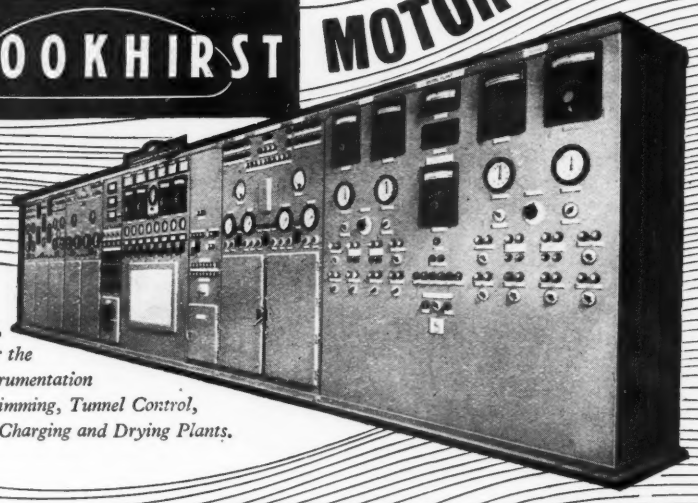
ANOTHER NOTABLE PROJECT



The 8′ x 8′ High Speed Wind Tunnel at the Royal Aircraft Establishment Bedford

Opened on June 27th, 1957, this Wind Tunnel, the largest constructed in this country for aerodynamic research, has Brookhirst motor control gear installed for controlling the tunnel auxiliaries including the main drive, compressors, and generating station auxiliaries.

DEPENDS ON BROOKHIRST MOTOR CONTROL



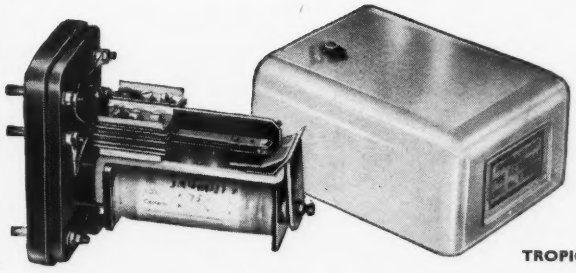
Auxiliary Plant Control Panel, sectionalised into five parts, for the control, indication and instrumentation of the Evacuating, Trimming, Tunnel Control, Charging and Drying Plants.

BROOKHIRST SWITCHGEAR LIMITED · NORTHGATE WORKS · CHESTER

A METAL INDUSTRIES GROUP COMPANY

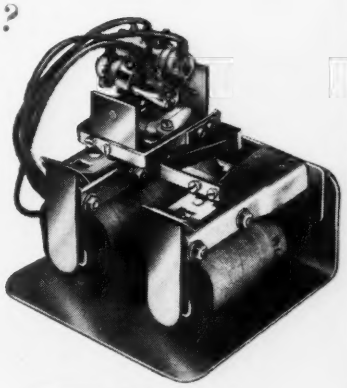
CVS-50

INSTANTA
RELAYS
MODELS from our NEW RANGE
The others will interest you.
Why not get in touch?



DCN/S. Intrinsically safe.
(M.O.F. & P. Approved.) Plug-in Relay.

TROPICAL FINISH WHEN REQUIRED



ACN/MEL. AC-DC Electrically released latching. Mercury Tube Relay.

Details of other types are available on request

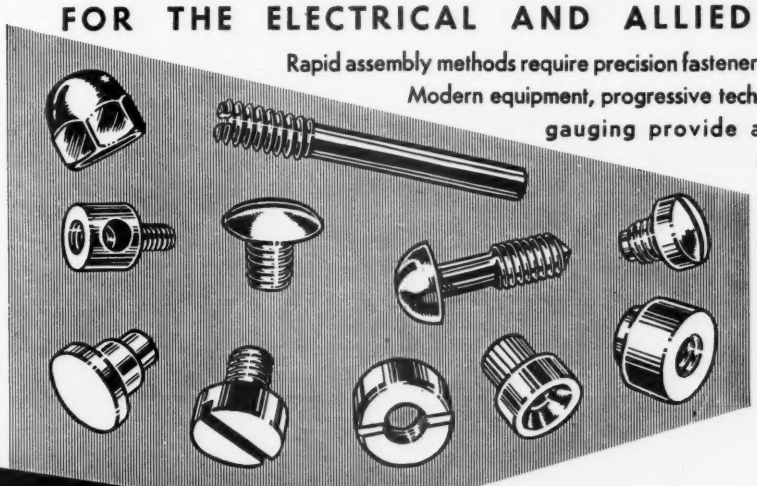
MAGNETIC CONTROLS LTD.
24 RITHERDON ROAD, LONDON, S.W.17
Tel.: BALham 0399
AND AT INSTANTA WORKS, UPPER STONE STREET, MAIDSTONE. Tel.: Maidstone 51485

Precision TURNED FASTENERS
FOR THE ELECTRICAL AND ALLIED TRADES

ALL AUTOMATIC AND CAPSTAN TURNED PRODUCTS

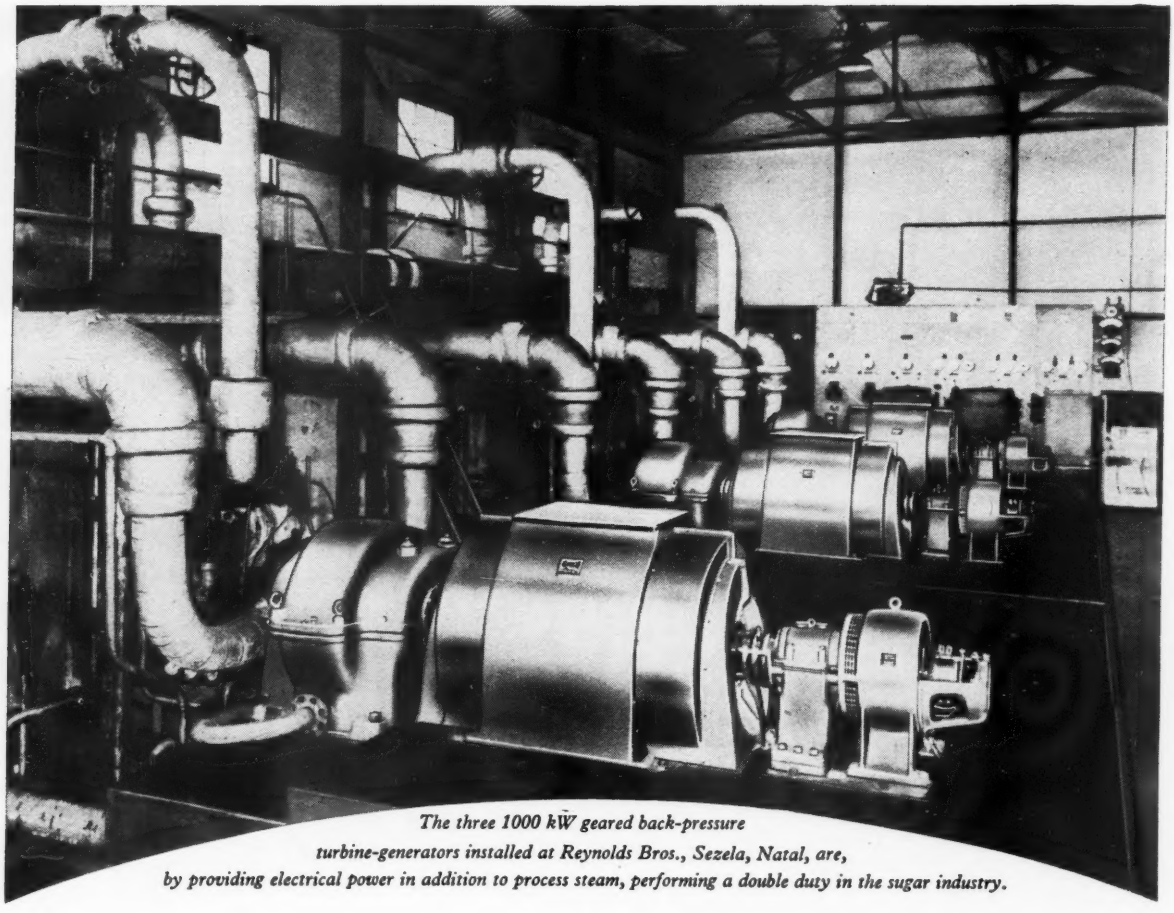
STOCKS of standard turned screws available for immediate use

Rapid assembly methods require precision fasteners and components. Modern equipment, progressive technique, and quality gauging provide an unsurpassed specialist service.



VERNIER
MANUFACTURING CO. LTD.
Garman Road, London, N.17
Telephone: Tottenham 5077

Geared Back-Pressure Turbines–



The three 1000 kW geared back-pressure turbine-generators installed at Reynolds Bros., Sezela, Natal, are, by providing electrical power in addition to process steam, performing a double duty in the sugar industry.

–cut your fuel costs

Great advantages can be gained by installing small back-pressure turbines for heating and process steam requirements in large factories. The back-pressure turbine is relatively cheap to install, occupies little space and requires only light foundations.

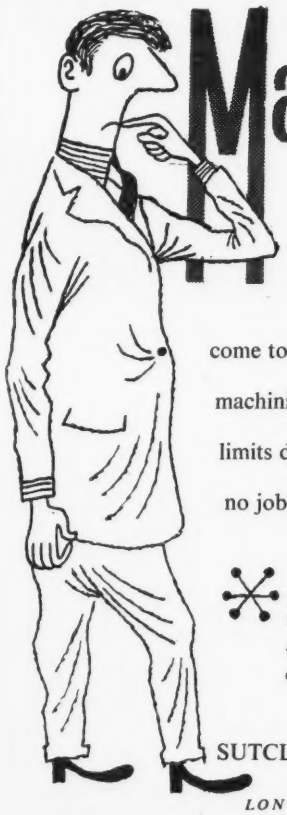
When Metropolitan-Vickers first installed one of their own back-pressure turbines at their Trafford Park Works in 1948 the cost of power and heating requirements for the factory were reduced by over £9,000 a year.

Please write for further details.

METROPOLITAN-VICKERS
ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

An A.E.I. Company

B/L 702



May we do your pressing?

For hot pressings and stampings—accurate well-finished and of consistently high quality—come to Sutcliffe Speakman. We undertake machining where necessary and can work to limits down to .0005". No quantity is too large, no job too complicated, no standard too exacting.

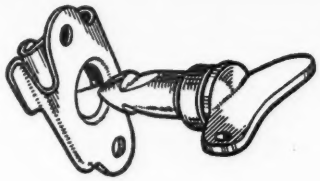
In all non-ferrous alloys including aluminium, brass, chromium copper, cadium copper, manganese bronze and nickel silver. Also castings in gun-metal, phosphor bronze and heat-resisting nickel chrome alloys.

SUTCLIFFE SPEAKMAN

SUTCLIFFE SPEAKMAN AND CO. LIMITED · *Leigh, Lancashire · Telephone: Leigh 94*

LONDON OFFICE: 2 CAXTON STREET WESTMINSTER S.W.1. TELEPHONE: ABBEY 3085

ODDIE FASTENERS



The Fastener with endless applications. Simple, Positive, Self-locking. Made in a variety of types and sizes.

Special Fasteners to suit customers' requirements

WIDELY USED IN THE ELECTRICAL AND RADIO INDUSTRY

Department "E.R."

ODDIE, BRADBURY & CULL LTD.
SOUTHAMPTON

Telephone 55883 *Cables: "Fasteners, Southampton"*

The APPELBE "BULB FIXER"

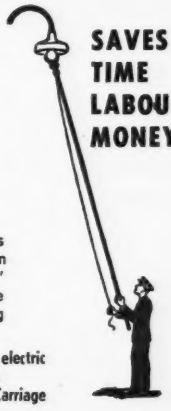
NO LADDERS REQUIRED

Telescopic appliance for fixing and removing electric bulbs. Any reasonable height can be reached.
Made of Aluminium and can be carried with ease on any cycle.

STANDARD MODEL
for 60 to 200 watt lamps at 16' 6" from ground. 6' 0" closed. 12' 0" extended. Weight 3 lb. Cycle clips and Extension Tubing supplied.

"A" MODEL
for 200 to 500 watt lamps E.S. Caps at 20' 0" from ground. 7' 0" closed. 16' 6" extended. Weight 5½ lb. Cycle clips and Extension Tubing supplied.

Used by the leading corporation and electric light companies throughout the world. Prices and particulars on request. Carriage Paid in Great Britain.



SAVES TIME LABOUR MONEY

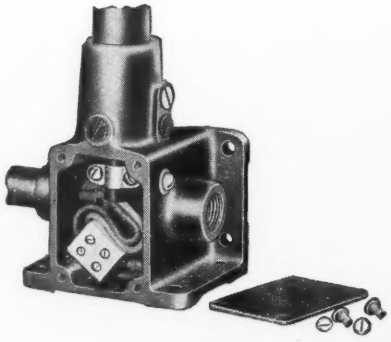
J. F. APPELBE & CO. LTD.
GREAT UNION STREET, HULL

Telephone 33522, 31212 and 8725. Telegraphic Address: "Appelbeco, Hull"

MEKELITE

GEARED JOINT

INDUSTRIAL LIGHTING UNITS



Catalogue sent free on request

Type W2803 can be supplied with 18 in. pillar as illustrated or with short vertical pivot. It is suitable for mounting on horizontal or vertical surfaces, or clamping to vertical tube (1 in. gas). Screwed conduit entries on both sides and clearance hole in bottom with "knock-out." Alternative cover incorporating switch with protection for dolly.

Various lengths of arm (maximum horizontal reach 54 in.). Many other bases and six sizes of reflector.

MEK-ELEK Engineering Ltd., 17 Western Road, Mitcham, Surrey
Phone: MITcham 3072 Cables: Mekelek, London

Protection for LIVE Products!

ROTUNDA TAPES ARE SOLD IN CANADA TOO

Take no chances-use

ROTUNDA

INSULATING TAPES

ROTUNDA LIMITED
DENTON
MANCHESTER

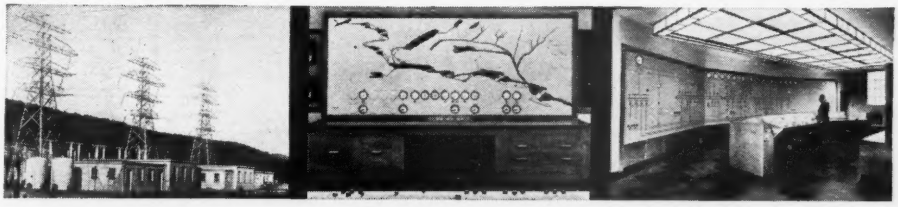
Standard TELECONTROL MINIATURE DIRECT CONTROL EQUIPMENT

Controls North of Scotland Hydro-Electric Board Power Stations

Already proven in service at the North of Scotland Hydro-Electric Board's Loch Sloy and Fasnakyle generating stations, *Standard* Miniature Direct Wire Remote Control equipment is now providing "finger-tip" supervision and control at Errochty Group Control Centre.

This nerve centre of the Tummel-Garry Hydro-Electric Scheme supervises the output from the six power stations—Errochty, Clunie, Rannoch, Tummel, Pitlochry and Gaur—with a total output of more than 230 MW.

The comprehensive *Standard* Telecontrol System of remote control, indication and metering, provides centralised information on machine loadings and capacity of the various stations, water levels at reservoirs and other essential intelligence. It enables the control engineer to obtain maximum use of rainfall in the area for power generation and maintenance of river levels.

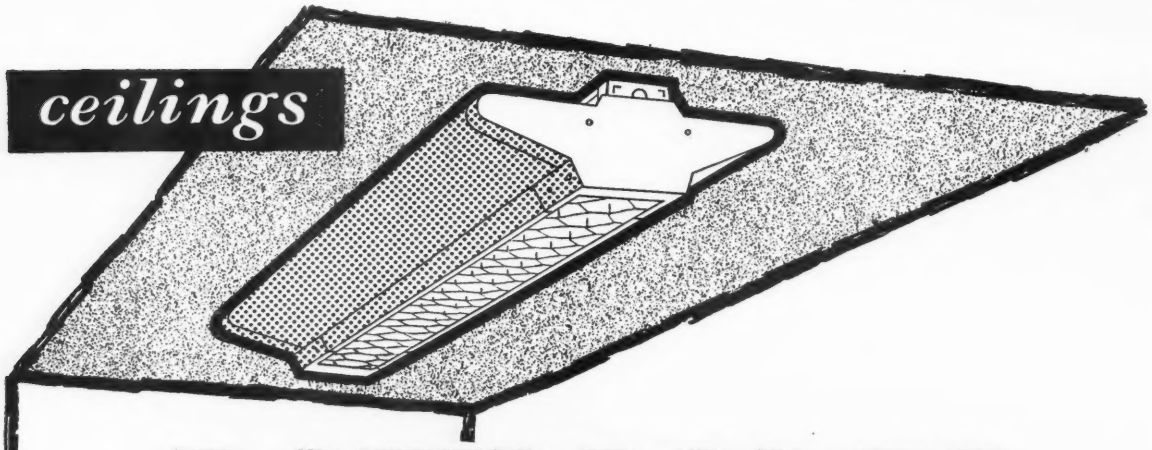


ERROCHTY GROUP CONTROL CENTRE Nr. Pitlochry, Perthshire

Standard Telephones and Cables Limited

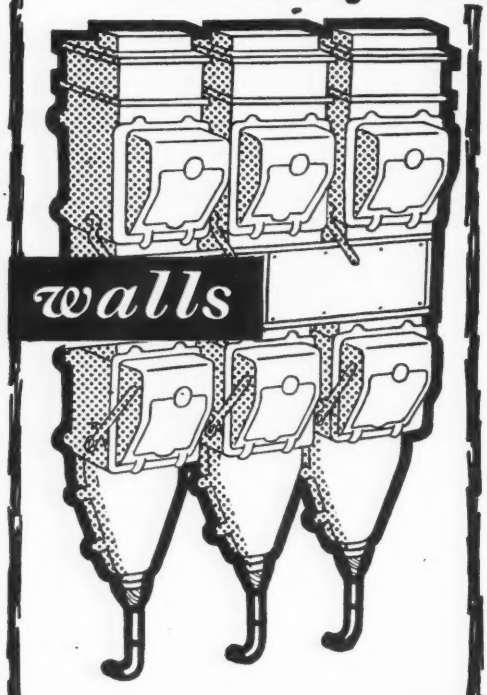
Registered Office: Connaught House, Aldwych, London, W.C.2

TELEPHONE DIVISION: OAKLEIGH ROAD · NEW SOUTHGATE · LONDON · N.11



RAWLBOLTS

For heavy fixing to Ceilings, Walls & Floors



Rawlbolt fixings in concrete, whether in ceilings, walls or floors, are fast and efficient and make real savings in time and money.

Older methods of fixing involve laborious chiselling of holes, grouting in and waiting several days for cement to harden. With Rawlbolts, the job is far simpler and quicker. Drill a hole, insert a Rawlbolt and tighten up. Your equipment is fixed and ready for use immediately.

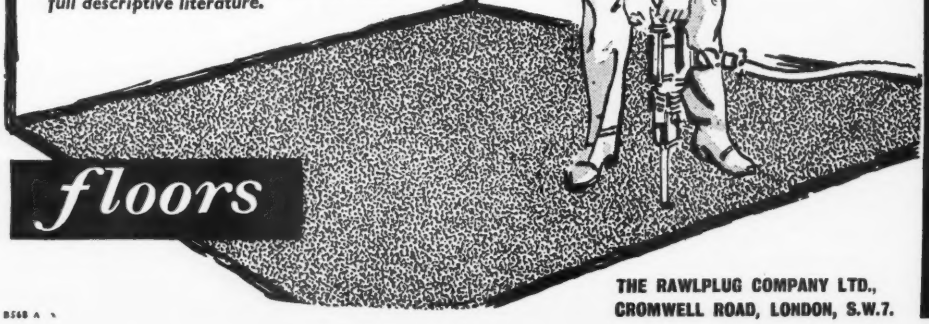
Civil Engineers, Consulting Engineers, Building Contractors, Structural Engineers are large and regular users of Rawlbolts.

TWO TYPES OF RAWLBOLT

LOOSE BOLT TYPE for fixing to floors

BOLT PROJECTING for fixing to walls and ceilings

For more information, please write for Dimensional Chart of the Rawlbolt Range and full descriptive literature.



THE RAWLPLUG COMPANY LTD., CROMWELL ROAD, LONDON, S.W.7.

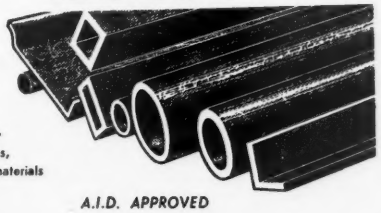
B568 A

INSULATING
TAPES
AND
MATERIALS
of every type

TAPES Including: Varnished Empire, Glass, Silk, Black Adhesive, Egyptian and India Cotton, Rubber, Pitch and Bitumen, P.V.C., etc.

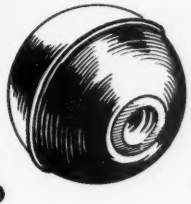
MATERIALS Including: Empire, Glass, and Silk Fabrics, Varnished Cotton and Glass Sleevings, Mica, Leatheroid, Presspahn, Combined Slot Insulation, Bakelite, Paxolin, etc.

Also
MACHINED PARTS AND STAMPINGS
in Mica, Micanite, Fibre, Bakelite, Paxolin, Ebonite, Asbestos, Pressboard, and many other materials



A.I.D. APPROVED

PAXTONS (ELECTRICAL) LIMITED
Weston-Super-Mare *Phone 1357*



SPHERICAL KNOBS

A wide range of sizes with male or female threads for the Electrical and Engineering Industries

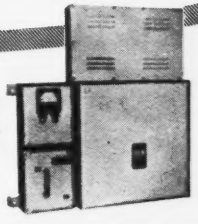
Full range of colours

Litholite
Plastic Mouldings since 1901

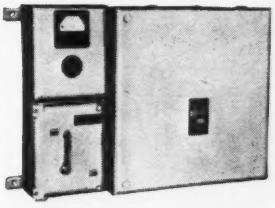
LITHOLITE Insulators & St. Albans MOULDINGS LTD
Sandown Road, WATFORD, Herts Tel WATFORD 4494

NEW
BKS RANGE OF AUTOMATIC MOTORSTARTERS

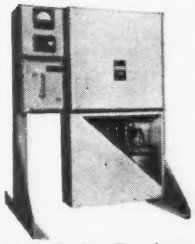
(Left)
Heavy Duty Direct On-Line Starters. Suitable for controlling motors up to 30 h.p.
List DO 60.



Automatic Stator Rotor Starters. Suitable for controlling slip ring motors up to 40 h.p.
List SR 60.



Heavy Duty Automatic Star Delta Starters. Suitable for controlling motors up to 55 h.p.
List SD 60.



Automatic Auto Transformer Starters. Suitable for controlling motors up to 40 h.p.
List AT 60.

Searching out new knowledge, translating it into products people can use, and then making these products widely available, is the role of our technical engineers. The new range of automatic motor starters announced in this advertisement embody modern design and advanced construction features for economy in installation and service. Application for literature will be dealt with by return of post.

BRITISH KLOCKNER SWITCHGEAR LTD.

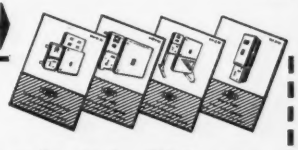
Head Office and Works: **CHERTSEY, SURREY**

Telephone: Chertsey 2067. Telegrams: Switchgear, Chertsey

SALES OFFICES:

MANCHESTER 4	Cromford House, Cromford Court. Tel.: Blackfriars 3903
GLASGOW:	249 St. Vincent Street. Tel.: Central 2479
NEWCASTLE:	4 Beechwood Avenue, Monkseaton, Whitley Bay, Northumberland. Tel.: Whitley Bay 24231
BIRMINGHAM:	190 Aldridge Road, Streetly, Staffordshire. Tel.: Streetly 1641

Send for these leaflets



To: BRITISH KLOCKNER SWITCHGEAR LTD. CHERTSEY, SURREY

Please send me copy of List **AT 60** **SR 60** **DO 60** **SD 60**
INDICATE BY TICK WHICH LIST/S REQUIRED

NAME .....
POSITION .....
FIRM AND .....
ADDRESS .....

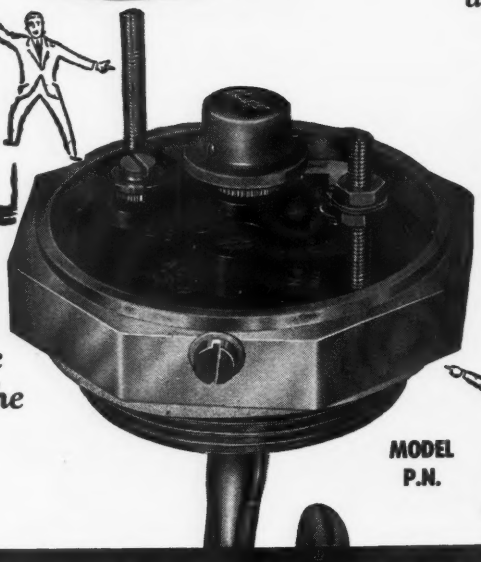
E.R.

TEMPERATURE CONTROL

by

THE THERMOSTATIC CONTROLS CO.

WE shall be pleased to submit special designs for all domestic and commercial applications, including combination units of heater and thermostat, or safety device.



MODEL P.N.

HEATING ELEMENTS

by

CONTROLLED HEATING UNITS (London) LTD.

Obtainable, complete or separately, from the same factory.

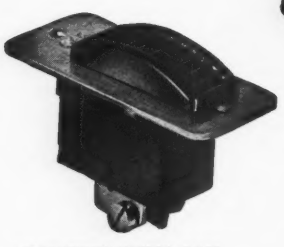
Enquiries to :—

AVENUE ROAD · HAMPTON · MIDDLESEX TEL. MOLESEY 3285/7

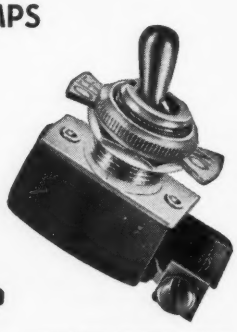
ARCOLECTRIC

SWITCHES & SIGNAL LAMPS

- For Industrial Equipment
- Domestic Appliances
- Electronic Instruments
- Automobile Switching

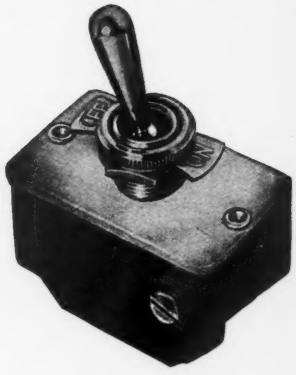


SLIDE THUMB SWITCH—S.645
3 amp., 250 volt

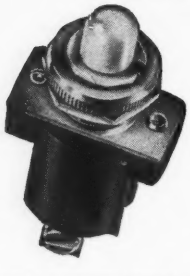


MINIATURE TOGGLE SWITCH—H.600
3 amp., 250 volt

MAINS VOLTAGE SIGNAL LAMP—S.L.81
Complete with built-in neon tube and resistance. Models from 80 to 500 volts.
Fixing: Single ½" hole.



10 AMP. TOGGLE SWITCH—M.30
For electric fires



DOOR OPERATED SWITCH—S.930
For refrigerators

SMALL POINTER KNOB—K.75
For ¼" spindles

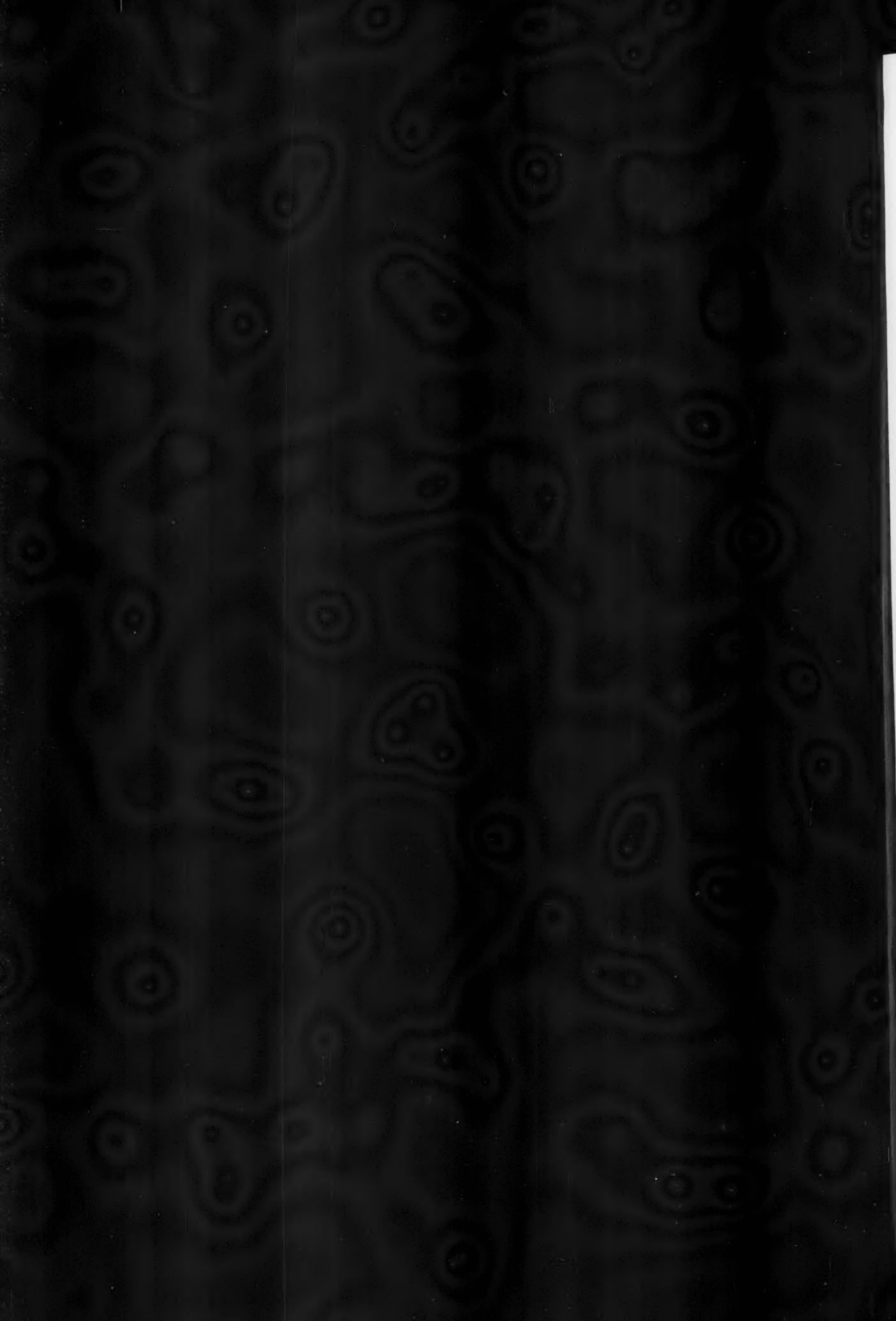
Write for latest Catalogue No. 131

Agents required for Australia and Sweden

ARCOLECTRIC SWITCHES · LTD

CENTRAL AVENUE, WEST MOLESEY, SURREY · PHONE: MOLESEY 4336

When there is a better switch Arcolectric will make it



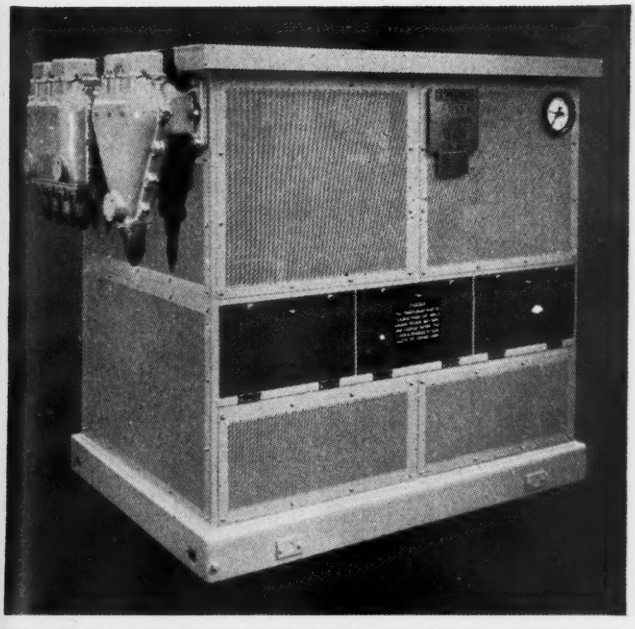
The benefits of silicone-insulated dry-type transformers are becoming better and better known:

* **No fire or explosion risk**
* **Reduced maintenance**
* **Frequent overloading permissible**
* **Smaller size and weight than O.N. or Class B units**
* **Dust, humidity and ventilation are no problem**
* **Can be placed at load centre, therefore making shorter low-voltage cable runs possible.**

The photograph below shows a 500kVA Ferranti dry-type, air-cooled distribution transformer with Class 'C' silicone insulation — B.S.2757 : 1956.

MS

Silicone insulated dry-type transformers ARE SAFER!



Here is a list of well-known British manufacturers already producing silicone-insulated dry-type transformers for the United Kingdom and overseas. These transformers have already been installed in:

Steel mills · Car factories
Newspaper plants · Food factories
Flour mills · Coal mines
Underground sub-stations
Office buildings · Blocks of flats
Departmental stores
Radar and airfield sites

BONAR, LONG & CO. LTD.
BRENTFORD TRANSFORMERS LTD.
BRUSH ELECTRICAL ENGINEERING CO. LTD.
THE ENGLISH ELECTRIC CO. LTD.
FERRANTI LTD.
FOSTER TRANSFORMERS LTD.
GRESHAM TRANSFORMERS LTD.
HACKBRIDGE & HEWITTIC ELECTRIC CO. LTD.
LONDON TRANSFORMER PRODUCTS LTD.
METROPOLITAN-VICKERS ELECTRICAL CO. LTD.
BRUCE PEEBLES & CO. LTD.
SOUTH WALES SWITCHGEAR LTD.
WODEN TRANSFORMER CO. LTD.

MIDLAND SILICONES LTD

(Associated with Albright & Wilson Ltd. and Dow Corning Corporation)

first *in British Silicones*

19 UPPER BROOK STREET · LONDON W1 · TEL: GRO 4551

Midland Silicones Limited manufacture in Great Britain the full range of silicone resins and elastomers used by transformer manufacturers in the construction of silicone-insulated dry-type units.

G

TDW/MS 91

These numbers

save time
note them now!

Examine carefully a TEMCO 13 amp socket outlet or switched socket outlet. One of the first features to impress you will be the way in which the terminals and terminal screws are positioned so that wiring can be carried out more easily, more quickly. That is not accidental but is characteristic of the care taken to ensure the highest possible efficiency for all TEMCO Accessories.

Other points you will observe in this range will be:

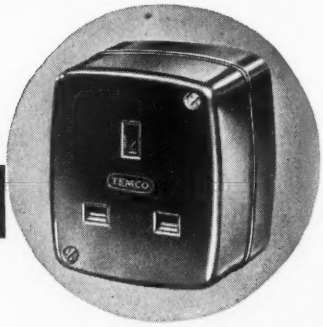
The extra large terminals.

The smooth working of the simple, yet robust shutter mechanism.

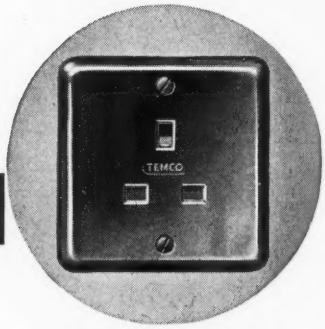
The snap acting switch with its solid silver contacts.

The extra deep recess at the back of the surface sockets.

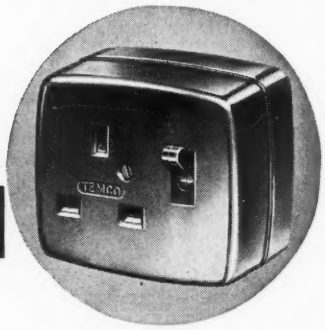
Cat. No. 1310 BROWN



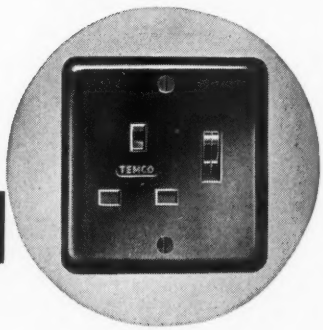
Cat. No. 1315 BROWN



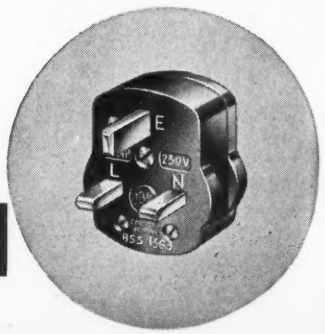
Cat. No. 1350 BROWN



Cat. No. 1355 BROWN



Cat. No. 1380 BROWN



These accessories are also available in cream. Please write for catalogue.

TEMCO

WIRING ACCESSORIES

T.M.C. – HARWELL (SALES) LTD.
37 Upper Berkeley Street, London, W.1.
A subsidiary of Telephone Manufacturing Co. Ltd.
Tel: PADdington 1867/8/9

Consult **Birch**
REGISTERED TRADE MARK
for
STUD TYPE RESISTORS

Stud type Regulating Resistors of front-of-board or back-of-board patterns. All resistors are fully tested for correct grading, insulation resistance and minimum high pressure test of 2,000 volts r.m.s. A.C. for one minute.
Write for list No. 120

VITREOUS ENAMELLED RESISTORS
Ferrule or wire end type: full range of 24 sizes — 1½—250 watts. List VE 190.

and for:
Asbestos Woven Mats
Heating Elements
Loading Resistors
Motor Operated Resistors
Sliding Resistors
Toroidal Resistors

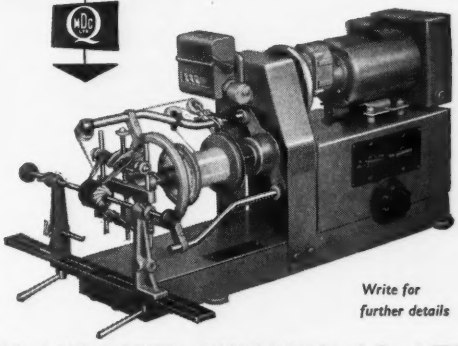
Birch
REGISTERED TRADE MARK

H. A. BIRCH & CO. LTD.
WOOD STREET, WILLENHALL, STAFFORDSHIRE
Telephone WILLENHALL 494 · 495 · Grams WILOHM WILLENHALL
LONDON OFFICE: 1-5 NORTHOLT ROAD, HARROW, MIDDLESEX
Tel.: BYRON 5120

QUICKWAY

armature
winding
machines

Illustrated here is Model 2B designed to wind 2 pole armatures 3" diameter 2¼" long, 24-45 S.W.G. wire size. Semi-automatic push button control, suitable for batch production where frequent change of armature size takes place.
Other machines available for repair work and continuous production.



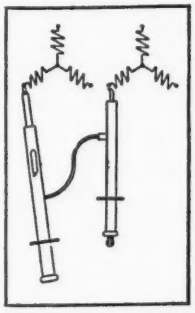
Write for further details

THE MIDLAND DYNAMO CO. LTD.
QUICKWAY WORKS, LEICESTER
Tel. 20172 (5 lines) Grams: "DYNAMO," LEICESTER

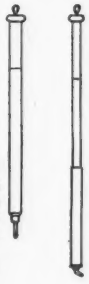
Is It Alive?

'WESTMINSTER' PATENT VACUUM TUBE DETECTORS
WILL SHOW

Visible indication on contact with a live conductor, or in case of high voltages as soon as Detector approaches and before contact is made.
Range 2,000 to 35,000 volts.



'WESTMINSTER' PHASING RODS
To locate interconnections between two A.C. systems.



'PARTRIDGE' PRESSURE DETECTORS
Give visible and audible indication of whether lines and contacts of draw-out switchgear are alive or dead.

NO EARTH CONNECTION REQUIRED

Write for full details to sole manufacturers:
The WESTMINSTER ENGINEERING Co. Ltd
(Dept. H.1) Victoria Road, Willesden Junction, London, N.W.10
Tel. ELGar 7372 (2 lines)

Still the Best Value in the Trade!

5 ft. 80 w. *Subject to Trade and Wholesale discounts*

Compare feature for feature— before you spend your money!

- **BACK PLATE** *FULL LENGTH—NO DUST ENTRY*
- **FIXINGS** *FLUSH—CONDUIT OR CHAIN*
- **END CAPS** *FILLED ENDS—SNUG CLOSURE ON LAMP*
- **CHOKE** *SCEMCO—WORLD RENOWNED FULLY BITUMENED FOR COOL AND SILENT WORKING*
- **STARTER LAMP** *LARGE CANISTER (CONCEALED)—ACCESS BY ENDCAP REMOVAL*
- **CAPACITOR** *TO M.O.W. STANDARD*
- **INDIVIDUALLY PACKED** *FOR SAFE TRANSIT*

*There is NO other fitting at **ANY** PRICE with **ALL** the value features of the "SCEMCO TRIUMPH"—YOUR OWN EYES and good judgment can prove this statement.*

SCEMCO, SCEMCO HOUSE, 53 GREAT EASTERN ST., LONDON, E.C.2
(or from your usual wholesaler). Telephone: BIShopsgate 1319

TAKE YOUR PICK

Our wide range of capacitors, incorporating all the very latest developments, are described fully in these new leaflets . . .

SEND NOW for COPIES

DALY has succeeded in maintaining full capacity values and working voltages in more compact designs, specially suited to ultra-modern equipment:

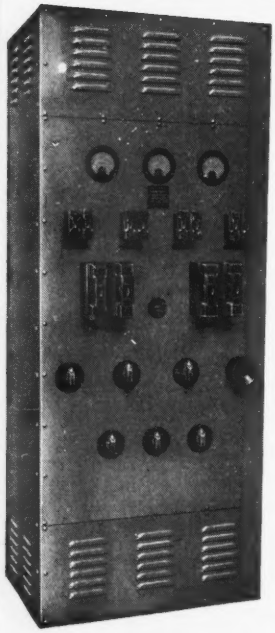
PHOTO-FLASH EQUIPMENT • DEAF AIDS
PRIVATE TELEPHONE INSTALLATIONS
AMPLIFIERS • D.C. POWER UNITS
TRANSISTOR EQUIPMENT
MAGNETISATION EQUIPMENT
TEST GEAR

DALY
ELECTROLYTIC CAPACITORS

Condenser Specialists for over 20 years.

DALY *(Condensers)* **LTD.,** WEST LODGE WORKS,
THE GREEN, EALING, LONDON, W.5. PHONE: EALING 3127-8-9. CABLES: DALCYON, LONDON

RECTIFIERS



WITH METAL RECTIFICATION

For: Battery Charging, Emergency Lighting, Engine Starting, Lift Control, Telephone Systems, Signals, Communications, Laboratories, Etc.

WE SHALL BE GLAD TO QUOTE FOR EQUIPMENT MADE TO SUIT YOUR OWN PARTICULAR PURPOSE.

PROMPT DELIVERY

CAYSON

A.I.D. APPROVED

Photo shows an Emergency Lighting Rectifier Cubicle.

CAYSON ELECTRICS LTD : WATFORD
London Office: ANGEL HOUSE, LONDON, N.1.
TEL: TERMINUS 0566 7 TEL: WATFORD 7156 & 7177

FURSE

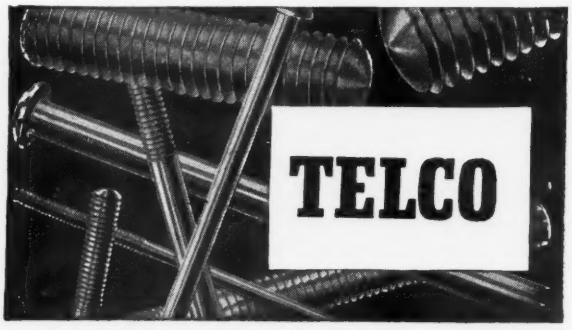
LIGHTNING CONDUCTORS

and Earthing Equipment

Largest Manufacturers and Exporters in Great Britain

Advisory and technical information service free — complete schemes and estimates. Illustrated literature on request.

W. J. FURSE & CO. LIMITED
33 Traffic Street (Tel. 88601-3 lines) NOTTINGHAM
Also LONDON, MANCHESTER, BIRMINGHAM, BRISTOL



Studding · Studs · Allthreads · Tie Rods

TELCO LTD., 3 Newman Street, London, W.1 MUSeum 5701/4

COLES

THE NAME THAT CARRIES WEIGHT

MODEL S12[illegible]
AENEAS

Weight—With standard jib unladen 19 [illegible]

OPTIONAL EQUIPMENT

[illegible]raking of lowering motion.
[illegible]xtensions—5' 0" and 10' 0".
—For faster hoisting speeds with light loads.
[illegible]dicator—Coles B & A automatic with audible and visual

With Fan and opening windows.
[illegible]h Heater and anti-freezer.
[illegible]assisted.
[illegible]tion—A larger travel motor and generator for increased [illegible]peeds.

—Twin rope grab, hook-on self-dumping grab or ring [illegible]grab up to 27/22 cu. ft. capacity. Electro magnets up to

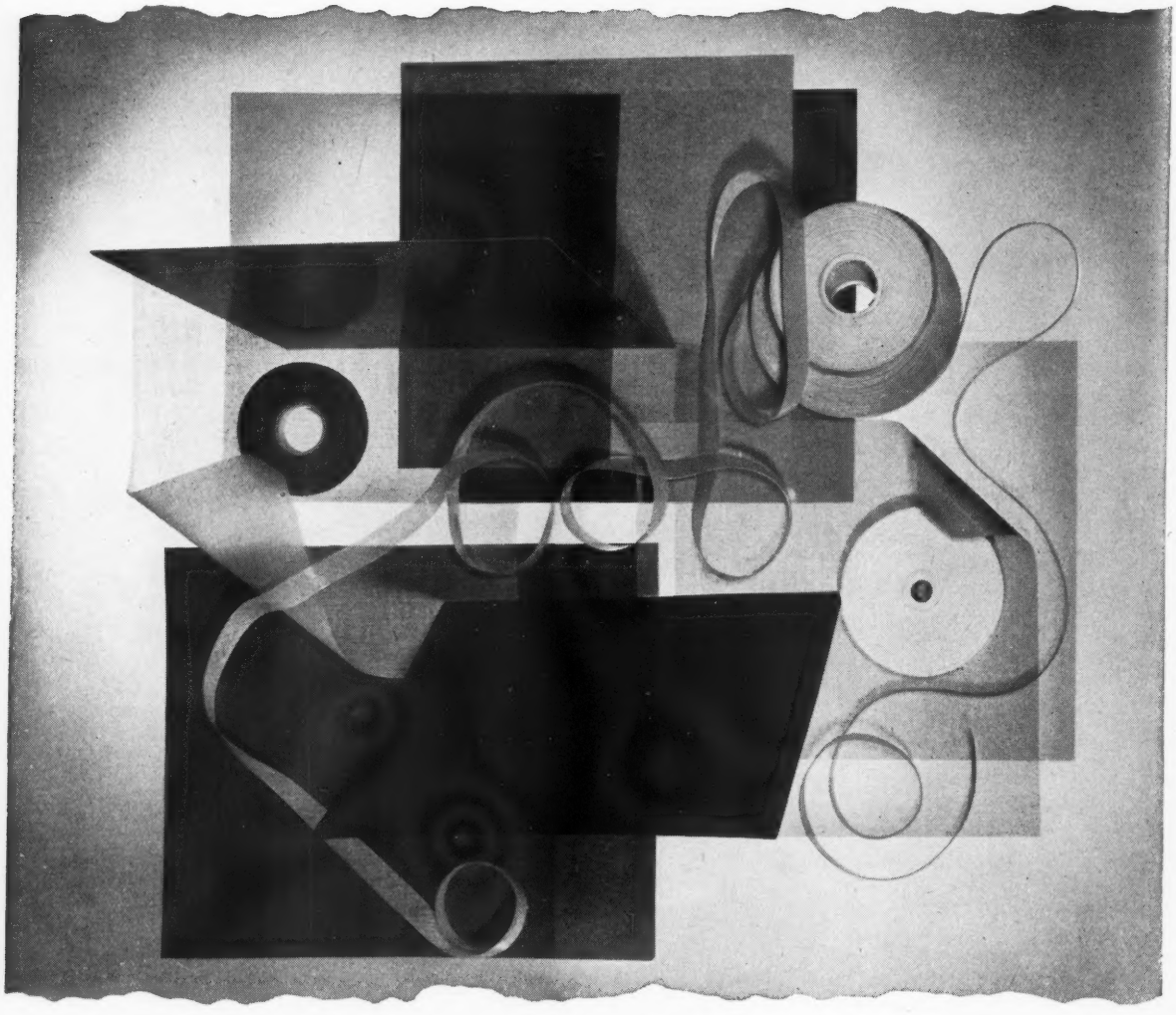
[illegible] for control of grab
[illegible] with twin rope grab.
[illegible] head, 2 side, 2 tail, radius indicator, jib head, cab

255

FRIDAY

C.F.C. The big hands in our industry buy these Coles cranes — find out why. R.T.

Designed, Manufactured and marketed by:-
STEELS ENGINEERING PRODUCTS LIMITED
Sunderland, England. Tel. 58281 (10 lines) Grams: Steel, Sunderland
SALES & SERVICE: Glasgow. 235 Bath St., C.2. Newcastle: Brunswick House, Brunswick Place. London: 143 Sloane St., S.W.1. Manchester. 155 Oxford Rd., 13. Birmingham: 39 Thorp St., 5



Sistoflex, Elephantide, Presspahn, Leatheroid, Fibre, Bakelite, Cotton and Varnished Tapes, Insulating Paper, Adhesive Tapes, Varnished Silks and Cambrics

All the best *

INSULATING MATERIALS

meet at

SPICERS

* 'Best'—*not necessarily the most expensive but, always, unquestionably the best of their respective kinds for insulating purposes. Remember, too, that Spicers range of papers, boards and packaging materials is the most extensive in Great Britain and is backed by full, efficient service from any of the Spicers branches in all parts of the country.*

SPICERS LTD • 19 NEW BRIDGE STREET • LONDON EC4 • BRANCHES THROUGHOUT BRITAIN • ASSOCIATED & SUBSIDIARY COMPANIES ALL OVER THE WORLD

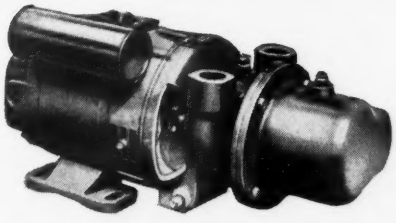
TBW E1

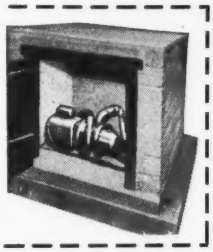
This new SIEMENS EDISWAN leaflet ready for you NOW

If you have not yet received a copy please write to:—

SIEMENS EDISON SWAN LTD. *An A.E.I. Company*
38-39 Upper Thames Street, London, E.C.4.
25 branches throughout the country

CHEAP PUMPING





The MII Mono Pump will give you 165 gallons of water for less than a ½d. in power cost—sufficient water for two days for the average household. And it is self-priming with a 20 feet suction lift.

- **It can be neatly tucked away in the garden—or it is silent in operation for indoor installation.**
- **It can also be used for pumping supernatant water from cesspools.**
- **No oiling or greasing required.**

The MONO pump

Attractive terms to Dealers

MONO PUMPS LIMITED
Mono House, Sekforde St., London, E.C.1.
Telephone: Clerkenwell 8911
Grams: Monopumps 'Phone London
and at Belfast, Birmingham, Capetown, Dublin, Durban, Glasgow, Johannesburg, Manchester, Melbourne, Newcastle, Wakefield. MP 270

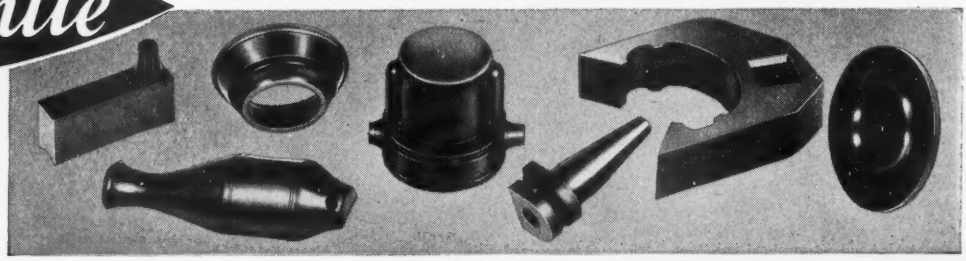
Insist on
T.E.C.
5 V.A.-100 K.V.A. TRANSFORMERS AND CHOKES

THREE PHASE OIL COOLED UP TO 100 K.V.A.

Full Catalogue on request—
The TRANSFORMER & ELECTRICAL CO. LTD.
HONYWOOD RD., BASILDON, ESSEX
Telephone: Basildon 20491/3

Dainite MOULDED RUBBERS SERVICE

SPECIALISTS IN RUBBER MOULDINGS FOR OVER 60 YEARS

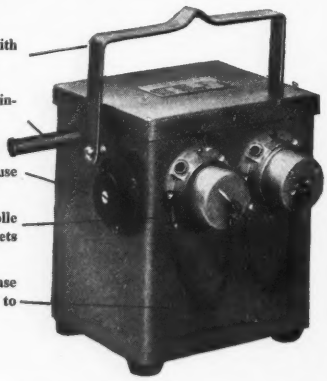


THE HARBORO' RUBBER CO. LTD., MARKET HARBOROUGH. TEL: 2274/5/6.

Portable
TRANSFORMERS

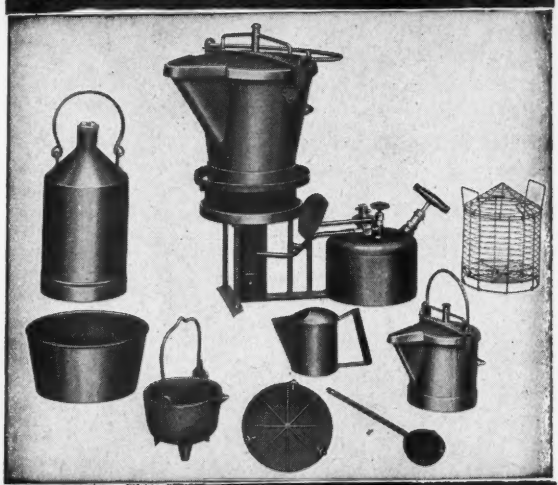
For use with portable machine tools, handlamps, etc. Secondary Voltages 25-110 volts, 12 volt can also be supplied on capacities of 250 VA and under. Capacities from 60 VA—1000 VA.

- Metal Carrying handle with indent for hanging to wall.
- Rubber cable gland for incoming supply.
- Panel mounting cartridge fuse unit with 2 spare fuses.
- One, two, or four Reyrolle low Voltage plugs and Sockets fitted as desired.
- Robust Mild Steel Case electrozinc coated prior to painting.



JOHN DRUMMOND (ENGINEERS) LTD
Bellcrag Works, Dalsholm Road, GLASGOW, N.W
Telephone: Maryhill 3315

Sheen CABLE JOINTING EQUIPMENT
the first choice for reliability



Manufactured by
HUGH PRICHARD & CO.(Nottm.)LTD.
Queen Street · Old Basford · Nottingham
Telephone - Nottingham 74373

Making Connections the "METWAY"

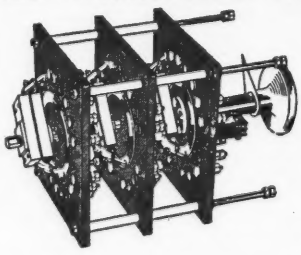
TERMINAL BLOCKS AND CONNECTORS

- **MOULDED** 5 - 40 Amp. 1 - 12 Way
- **FLEXIBLE NYLON** 5 - 30 Amp. 1 - 12 Way
- **PORCELAIN** 5 - 60 Amp. 1, 2, 3 way, with or without centre fixing hole

For further details ask for Cat. No. OHN/32/ER

METWAY WORKS, KEMP TOWN, BRIGHTON

H.B. TRANSFORMER TAPPING SWITCH TYPE L



Interlocked with micro break switch

Pull Handle to release Lock, then turn

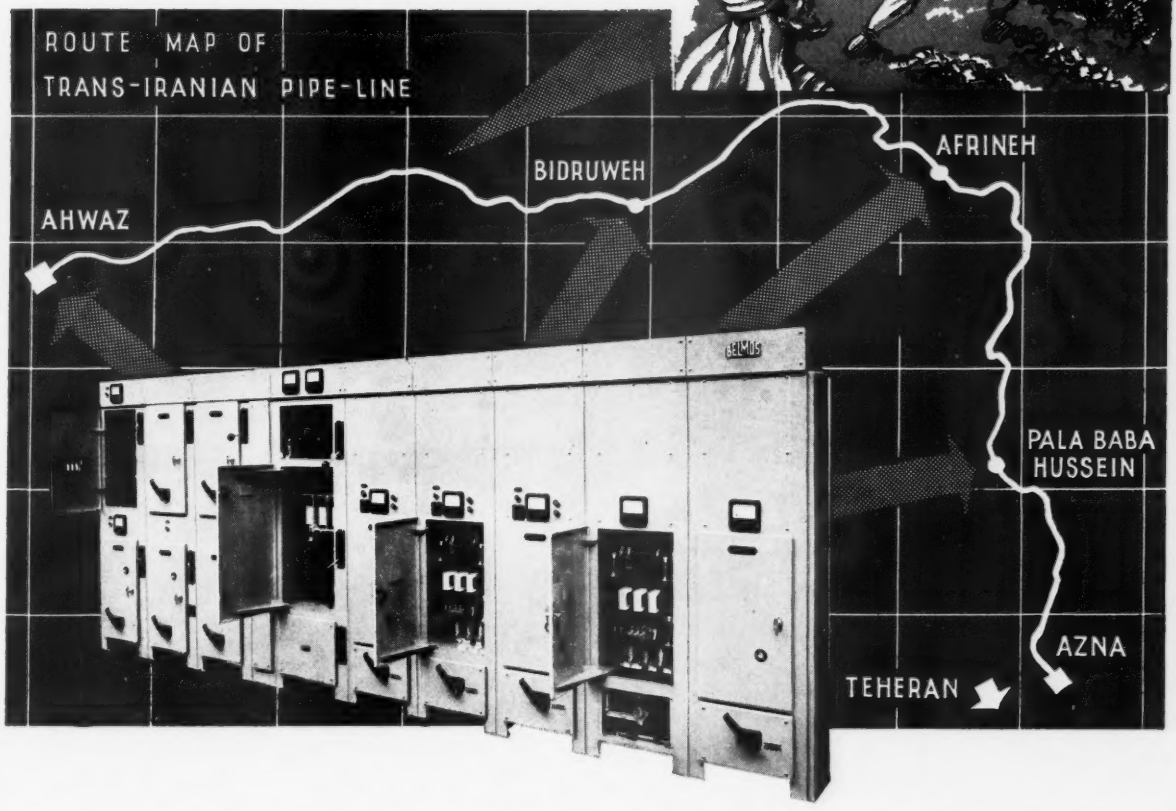
Also Type O without interlock and Type C for on load switching

SINGLE OR MULTI POLE

Phone: Kings Norton 1604

HENLEY BURROWES & CO. LIMITED
Factory Centre: KINGS NORTON, BIRMINGHAM

BELMOS SERVES THE OIL INDUSTRY ABROAD



Running for 300 miles, the Trans-Iranian oil pipeline connects the town of Ahwaz (a focal point of the existing crude oil pipeline system of sixty miles north of Abadan), to the town of Asna, forming the southern part of a project which, in all, will stretch from Abadan to Teheran ; the line from Abadan to Ahwaz being already in existence, while the Northern section from Asna to Teheran is being laid by a French firm. The completed pipeline will cover some 580 miles and will convey Gas Oil, Kerosene and Motor Spirit.

There are four pumping stations between Ahwaz and Asna, each station being similar in engine capacity (1,500 h.p.). The main control gear for the electrically operated pumps and compressors at each station comprises a Belmos Group Control Board of the industrial type with appropriate remote control stations—the latter including flameproof units at hazardous locations.

Much of the pipeline crosses difficult mountainous terrain, reaching a height of nearly 7,000 feet above sea level. The present stage has a capacity of 1,000,000 tons a year and provision has been made for doubling this, together with extra pumping stations.

The Control Board shown is typical of the four supplied, and comprises an incoming air-break circuit breaker, five stator/rotor starters for slip ring motors, and four direct-on line starters for squirrel cage motors, with an additional feeder circuit at AHWAZ only.

Acknowledgements :

We are indebted to Messrs. Costain-John Brown Ltd., who designed and constructed the pipeline project as main contractors, for permission to use the information given.

the Belmos company limited

BELLSHILL :: LANARKSHIRE

LONDON • GLASGOW • BIRMINGHAM • NEWCASTLE • MANCHESTER • SHEFFIELD • CARDIFF

G*

THE CABLE FOR YOU

In addition to our wide range of cable manufacture, we specialise in the production of cable assemblies, leads and cords

RISTS

Please write for further details to Electrical Division

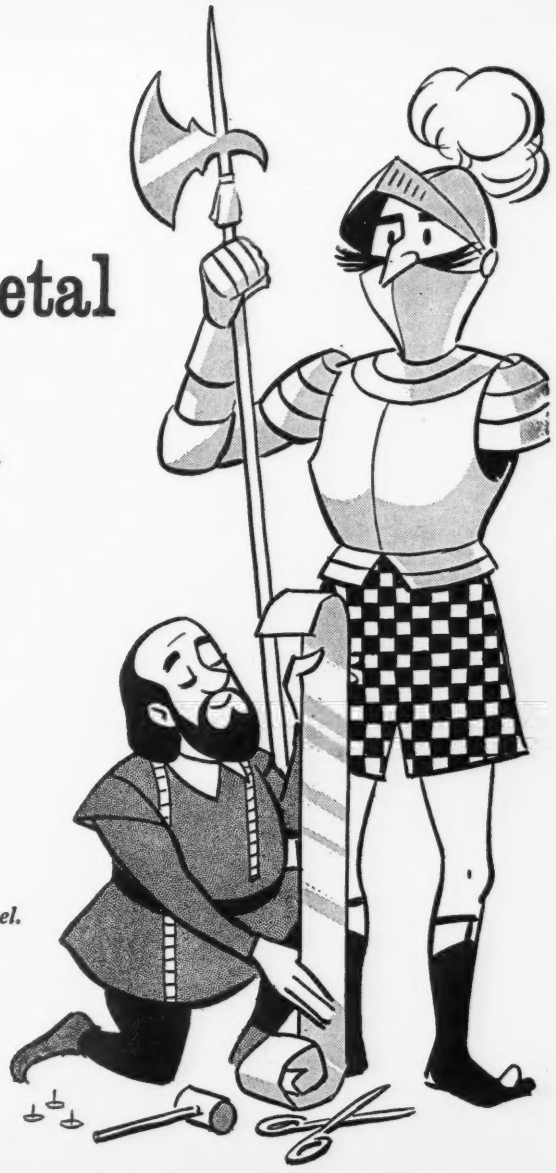
RISTS WIRES & CABLES LTD.

LOWER MILEHOUSE LANE • NEWCASTLE-UNDER-LYME • STAFFS

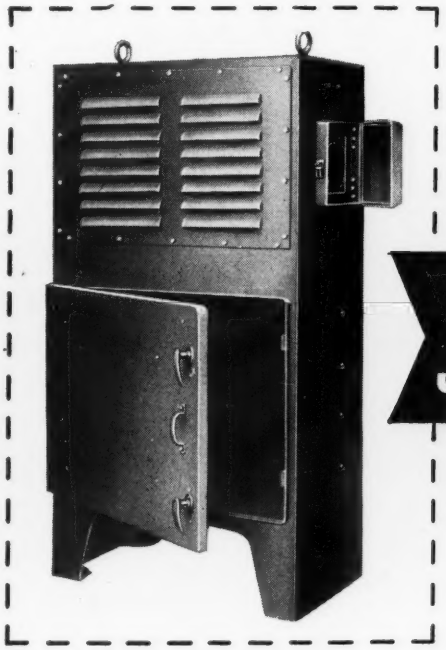
tailors in sheet metal

For centuries Midland craftsmen have
led the world in the art of tailoring sheet metal.

Today, combining new metals with
long acquired skill and experience, we
are making the products demanded by this
atomic age and offer a specialized
service to the electrical and
electronic industries.



Illustrated here is a switch-gear housing, an example of one of our many fabrications in sheet steel.



S. Taylor & Co. Ltd
John Grove & Son (B'ham) Ltd

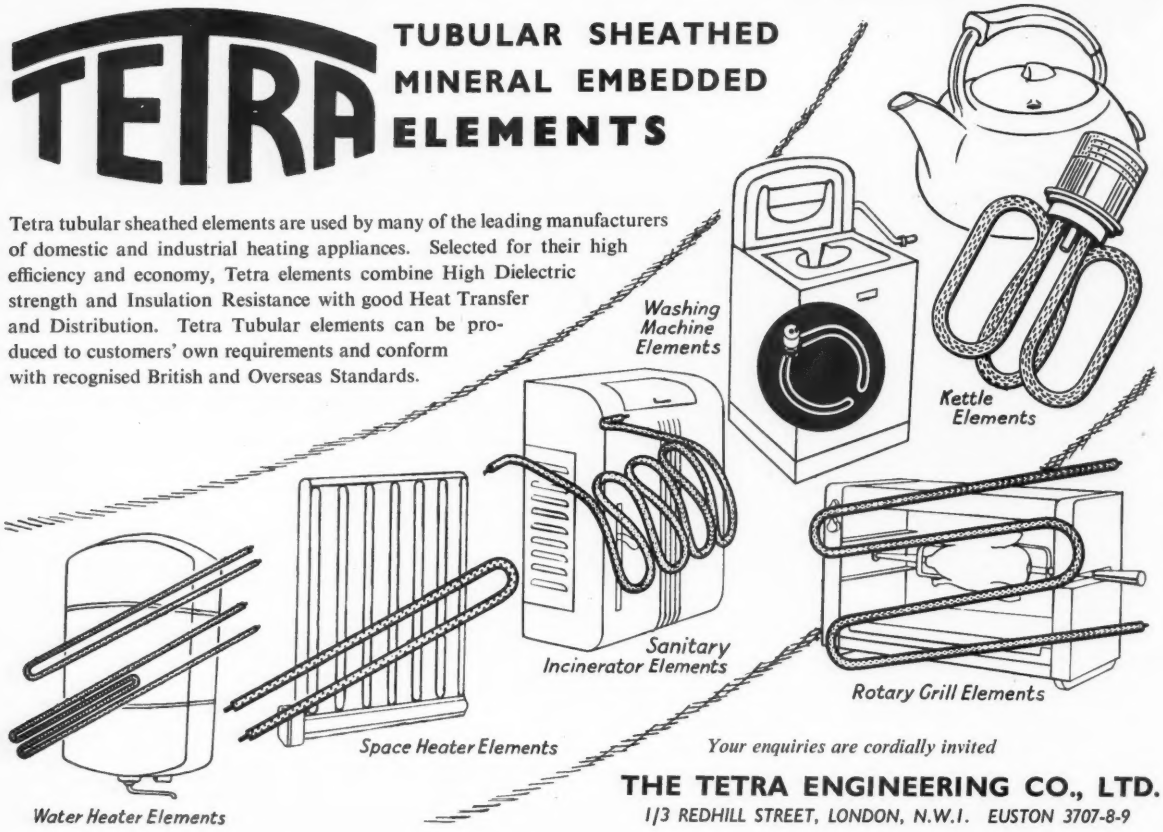
145 LIONEL STREET, BIRMINGHAM 3. Telephone: Central 7781
Brookvale Road, Witton, Birmingham 6. Telephone: Birchfields 5051

Members of the Warne-Wright Group
—who are large scale manufacturers of Nuts and Bolts, Repetition Parts, Stampings and Pressings and Drop Forgings for all Industries

TETRA

TUBULAR SHEATHED MINERAL EMBEDDED ELEMENTS

Tetra tubular sheathed elements are used by many of the leading manufacturers of domestic and industrial heating appliances. Selected for their high efficiency and economy, Tetra elements combine High Dielectric strength and Insulation Resistance with good Heat Transfer and Distribution. Tetra Tubular elements can be produced to customers' own requirements and conform with recognised British and Overseas Standards.



Your enquiries are cordially invited

THE TETRA ENGINEERING CO., LTD.
1/3 REDHILL STREET, LONDON, N.W.1. EUSTON 3707-8-9

The ASR-1150
Weighs 11 lb.
Measures 8½ x 4½ x 5
Price £25.16.0 Net

A NEW SMALL AUTOMATIC A.C. VOLTAGE STABILISER

This Stabiliser, of the A.C. automatic voltage step-regulator pattern, will handle loads up to over 1 kilowatt—and has an output of 5 Amperes at (usually) 230 volts. As a general rule it weighs only about 1/10th of the so-common "choke-condenser" types offered by many competitive firms. It has no large high-rating capacitors—which fail regularly in "resonated" types of Stabilisers, and which are very expensive to replace.

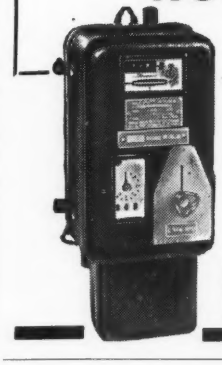
ASR-1150 is insensitive to changes of mains frequency, works equally well from 0% to 100% load (maximum loading 1150VA), and has sinusoidal output waveform. The degree of Stabilisation it provides is ample for very many purposes.

Complete details of our entire range of Regulators, of which there are many patterns ranging from 200 VA to about 30 kVA (single-phase) are given in our new 32-page Automatic Voltage Regulator Catalogue (5-574) which will be sent at once against your written request.

Claude Lyons Ltd.

STABILISER DIVISION · WARE ROAD · HODDESDON · HERTS
CL34

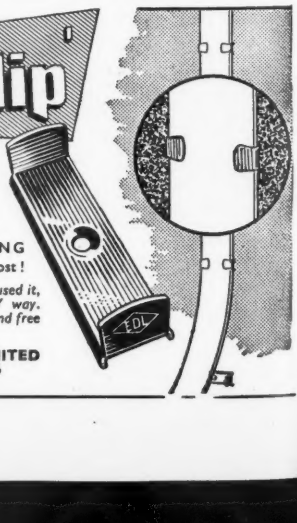
HOUSE SERVICE METERS



Credit Pattern
and Prepayment Type
200-240 v. A.C. S/Ph 50 c. (& D.C.)
AVAILABLE FROM STOCK
POLYPHASE 400-440 v. 3-Wire Type
Ex Stock

UNIVERSAL ELECTRICAL CO.
217-221 City Road, London, E.C.1

"Strip-Clip"



A BETTER
SIMPLER
QUICKER
way of fixing COPPER EARTHING STRIP . . . at a quarter the cost!

E.D.L.

Once you have used it, it is the ONLY way. Write for list and free samples.

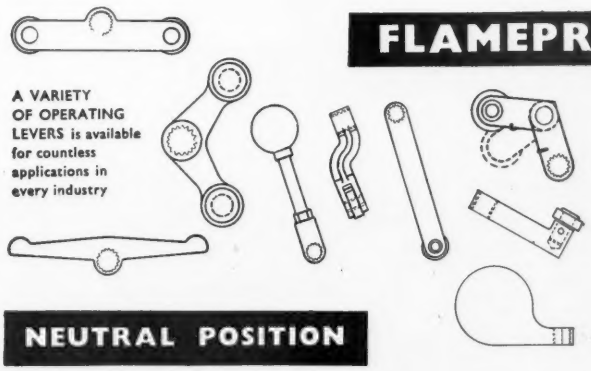
THE ELECTRIC DEPÔT LIMITED
Pritchett Street, Birmingham 6
Phone: ASTon Cross 1381

limit switch

For all heavy duty limit switch applications, particularly those to withstand conditions of extreme severity, there is a suitable B S A — ACME SNAP-LOCK of either water, oil and dust proof or flameproof versions. The superiority of this switch is due largely to the simplicity but ruggedness of its mechanical and electrical units contained in seperate compartments within a robust housing. Unique Snap-Lock design ensures self-wiping quick make and break, positive contact, maximum resistance to wear, and accurate repetitive tripping.

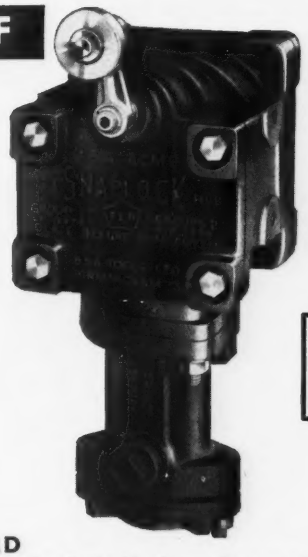
WATER, OIL & DUST PROOF

STANDARD



A VARIETY OF OPERATING LEVERS is available for countless applications in every industry

FLAMEPROOF



LICENSED **FLP** No. 3574 Group 1 No. 3575 Group II & III

NEUTRAL POSITION

These limit switches are now available in Neutral Position versions. Spring-loaded devices return the operating lever to the central (neutral) position. One or both of the springs are removable for various circuit arrangements. A third spring is supplied for converting to one normally made and one normally broken circuit.

B·S·A ACME

MADE UNDER LICENCE FROM NATIONAL ACME CO. U.S.A.

snap-lock

B.S.A. TOOLS LTD. BIRMINGHAM·33·ENGLAND

Sole Agents Gt. Britain

BURTON GRIFFITHS & CO. LTD.

Snap-Lock Division : 93 Albert Embankment, London, S.E. 11

Phone : RELIANCE 3891

Ad. No. 420

STANDARD

Single pole, double break, double throw, operates with either circuit normally open with other closed, or maintaining in either position, or available with central neutral position: return springs removable for various circuit arrangements. Heavy die-cast case. Water, oil and dust proof. Conduit ¾" in. B.S., or No. 3 Admiralty Pattern Cable gland entry. Two screw side mounting or backplate mounting in two styles, or Tandem style (back to back mounting). Operating lever position adjustable in 7·5 deg. increments through 82.5 deg. either way from normal. Levers for a variety of applications.

FLAMEPROOF

Buxton certificates No. 3574 (Group I) No. 3575 (Groups II and III gases). Meehanite iron castings. Self wiping solid silver contacts. Interchangeable plugs and sockets. Internal mechanism removable as a unit for servicing. **Single SWA cable entry (standard); double entry if required.** Operating lever position adjustable in 7.5 deg. increments through 360 deg. Levers for a variety of applications. **TYPE HLB**: Single pole, double break, having one normally closed and one normally open circuit — reversible by transferring the return spring. Return spring removable for external manual operation. **TYPE HLB/NP:** Single pole, double break, double throw, with central neutral position. Return springs removable for various circuit arrangements.

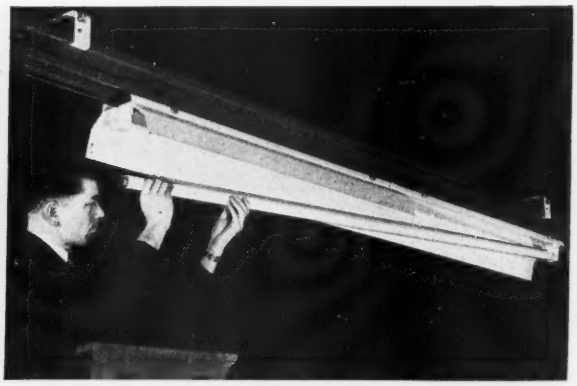
ATLAS INDUSTRIAL TRUNKING

Atlas Industrial Lighting Trunking integrates specially designed fluorescent lighting fittings with industrial trunking capable of carrying power and lighting distribution cables and other services if necessary. All lighting and installation equipment is provided and the system offers these advantages:

1. Installation is easy and economical.
2. Unique design features simplify maintenance.
3. Complete flexibility is retained in the lighting layout.

Two types of trunking are available, with open or enclosed ducts, for use with 8 ft. or 5 ft. fluorescent fittings. Suspension fixing centres are adjustable up to a maximum span of 16 ft. 6 ins.

Control gear trays are hinged to fold in half, and can be unhooked and carried away for servicing.

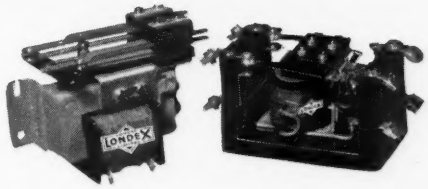


8 ft. gear trays incorporate spring-loaded bi-pin lampholders. 8 ft. tubes can be removed or replaced single-handed.

Atlas leads in lighting

ATLAS LIGHTING LIMITED 233 SHAFTESBURY AVENUE LONDON WC2 *A subsidiary company of Thorn Electrical Industries Ltd*

LONDEX Relays

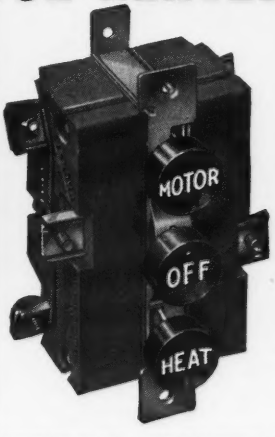


TYPE L.F. Silver Contacts. One Open. One Closed.
TYPE L.F. Three Changeover Contacts.
TYPE MOL. Two Changeover Contacts.
ALL COILS 200-250 V A.C.

These MODELS AVAILABLE FROM STOCK

LONDEX LTD.
ANERLEY WORKS, LONDON, S.E.20. SYDenham 6258

FOR HEATED WASHING MACHINES



Jelson

PRESS BUTTON SWITCHES ARE A

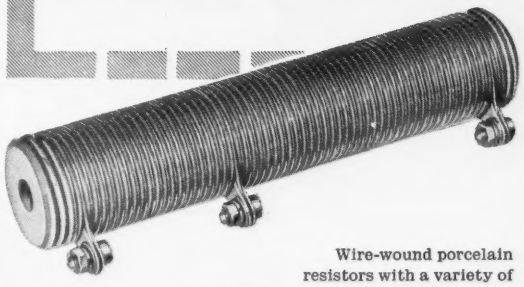
TECHNICAL ADVANCE WITH
COMMERCIAL ADVANTAGE

Two AC only 15 amp 250 v D.P. Switches in one unit—ceramic insulation. Three varieties of operation—Independent, Interlocked sequence or Interlocked changeover. With or without manually reset Thermal trip for Heating Element and/or current overload trip for protecting Motor.

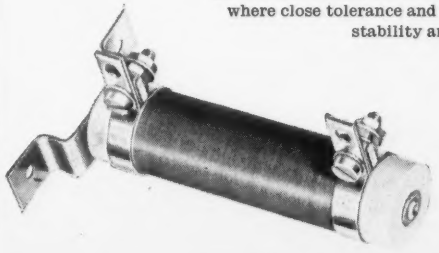
We shall be pleased to send full details.

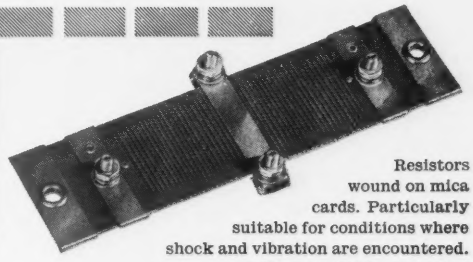
JELSON ELECTRIC LTD. PHONE: ACO. 0866
SPRING ROAD, TYSELEY, BIRMINGHAM 11

WIRE WOUND RESISTORS



Wire-wound porcelain resistors with a variety of mountings. Mainly for small loadings where close tolerance and electrical stability are needed.



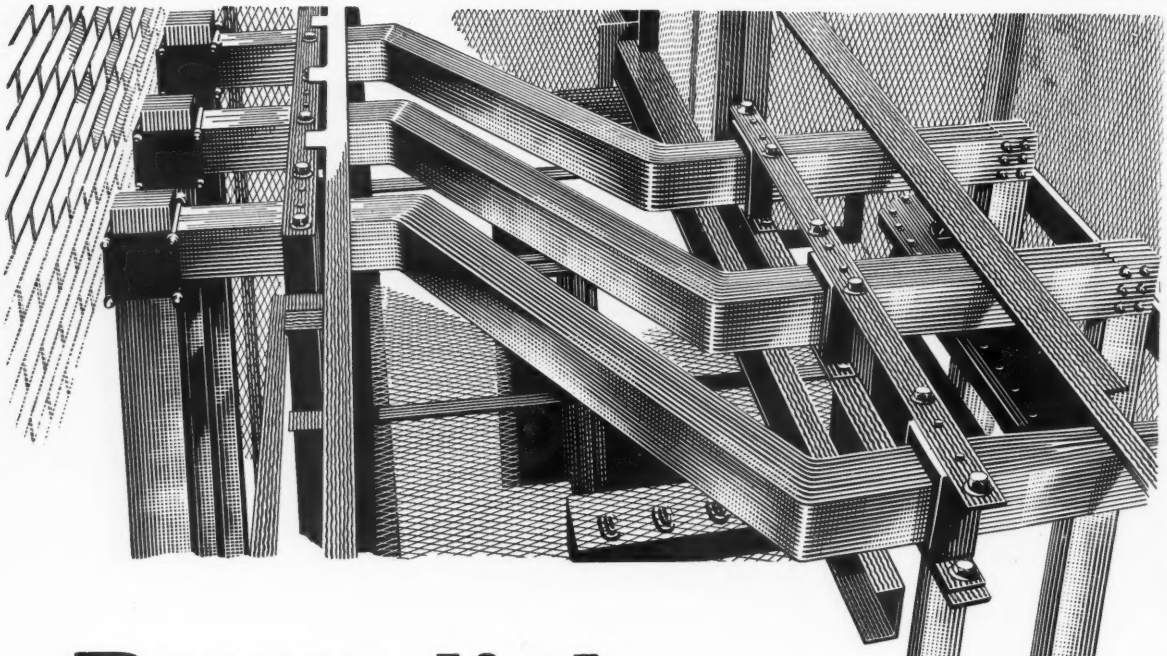


Resistors wound on mica cards. Particularly suitable for conditions where shock and vibration are encountered. Easily mounted in groups for high wattage dissipation.

Made by

Cressall

THE CRESSALL MANUFACTURING COMPANY LIMITED
(A subsidiary of The Expanded Metal Co. Ltd.)
ECLIPSE WORKS • TOWER STREET • BIRMINGHAM 19 • Tel: Aston Cross 2666
LONDON OFFICE: BURWOOD HOUSE • CAXTON STREET • S.W.1 • Tel: ABBey 7766



Power link

Between the power line
and the assembly line
everything must be
controlled, ordered
and completely prescribed.

Anacos Copper Busbars
are performing their function
in this and in countless
other instances.

Trustworthy, tested,
absolutely reliable.

ANACOS REGD.
COPPER BUSBARS

FREDERICK SMITH & CO.

Manufacturers of "Anacos" Copper and Copper Alloy Conductors

ANACONDA WORKS · SALFORD 3 · LANCS

BARE AND INSULATED ELECTRICAL CONDUCTORS OF ALL TYPES

THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED	FREDERICK SMITH & CO.	THE LIVERPOOL ELECTRIC CABLE CO. LTD.	VACTITE WIRE CO. LTD.

From the *Cold* of northern Canada to the Desert's Burning *Heat*

18,000 hours - no wear

"Some two years ago we sold a single cylinder Armstrong Siddeley Diesel Engine driving a 3½ K.W. Generator. We have just been out to this machine which is in Northern B.C., and found that although it has run twenty-four hours a day for these two years, the owner figures it must have run approximately eighteen thousand hours — we could find nothing whatever wrong with the machine." *Hoffars Limited, Vancouver, B.C.*

24 hours a day at 110°f

"We have had no trouble whatsoever with the Armstrong Siddeley engine due to heating up. The normal temperature in Syria varies from 104° to 110° in summer, and moreover the engines work 24 hours a day in the irrigation season. Wear on moving parts is advantageous in comparison with any other reputable engine." *B.R. Walters, Hajjar & Company, Aleppo.*

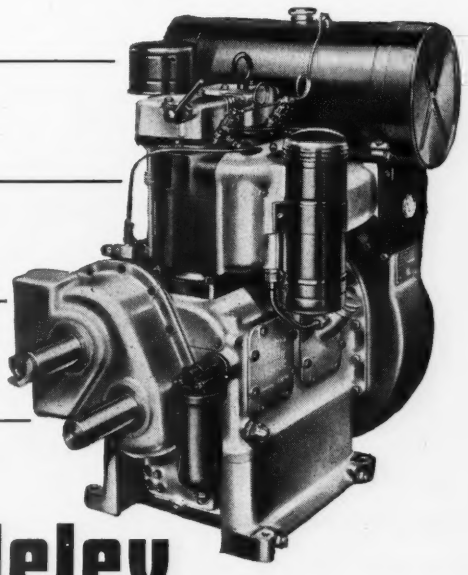
These are only two of the hundreds of similar letters on the files.

YEARS OF KNOW-HOW: The diesel engines are manufactured with the same precision as the Hawker Siddeley Group's world-famous aero engines.

MATERIAL-CHECKED: Armstrong Siddeley experts regularly visit suppliers of materials and components to check on their quality controls

PRODUCTION-CHECKED: Engines are taken off the production line at random and given a fifty-hour running test.

THERE IS NO MORE RELIABLE DIESEL ENGINE.
Three models: 6-11 h.p., 14-22 h.p., 20-33 h.p.
Write now for brochures.

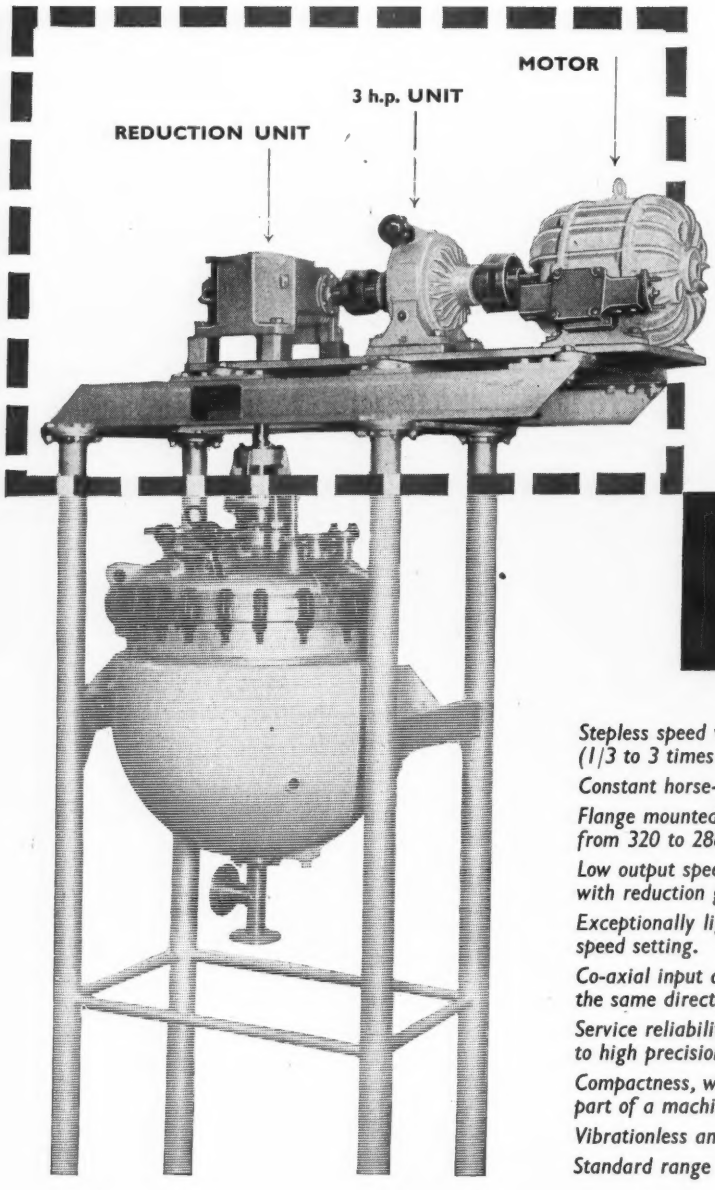


Armstrong Siddeley

AIR COOLED Diesels

ARMSTRONG SIDDELEY (BROCKWORTH) LTD • HUCCLECOTE • GLOUCESTER

MEMBER OF THE HAWKER SIDDELEY GROUP



Metal Propellers Limited uses the Kopp . . .

GEARLESS GEARBOX

Stepless speed variation over a 9 to 1 output speed range (1/3 to 3 times the input speed).

Constant horse-power transmitted throughout the speed range.

Flange mounted motors (when required) giving output speeds from 320 to 2880 r.p.m., and from 480 to 4320 r.p.m.

Low output speeds down to 1 to 9 r.p.m., or lower, obtained with reduction gears, flange mounted to the Variator.

Exceptionally light, sensitive and accurate control of speed setting.

Co-axial input and output shafts which rotate in the same direction.

Service reliability resulting from a simple design manufactured to high precision limits.

Compactness, with consequent ease of mounting as an integral part of a machine.

Vibrationless and silent performance.

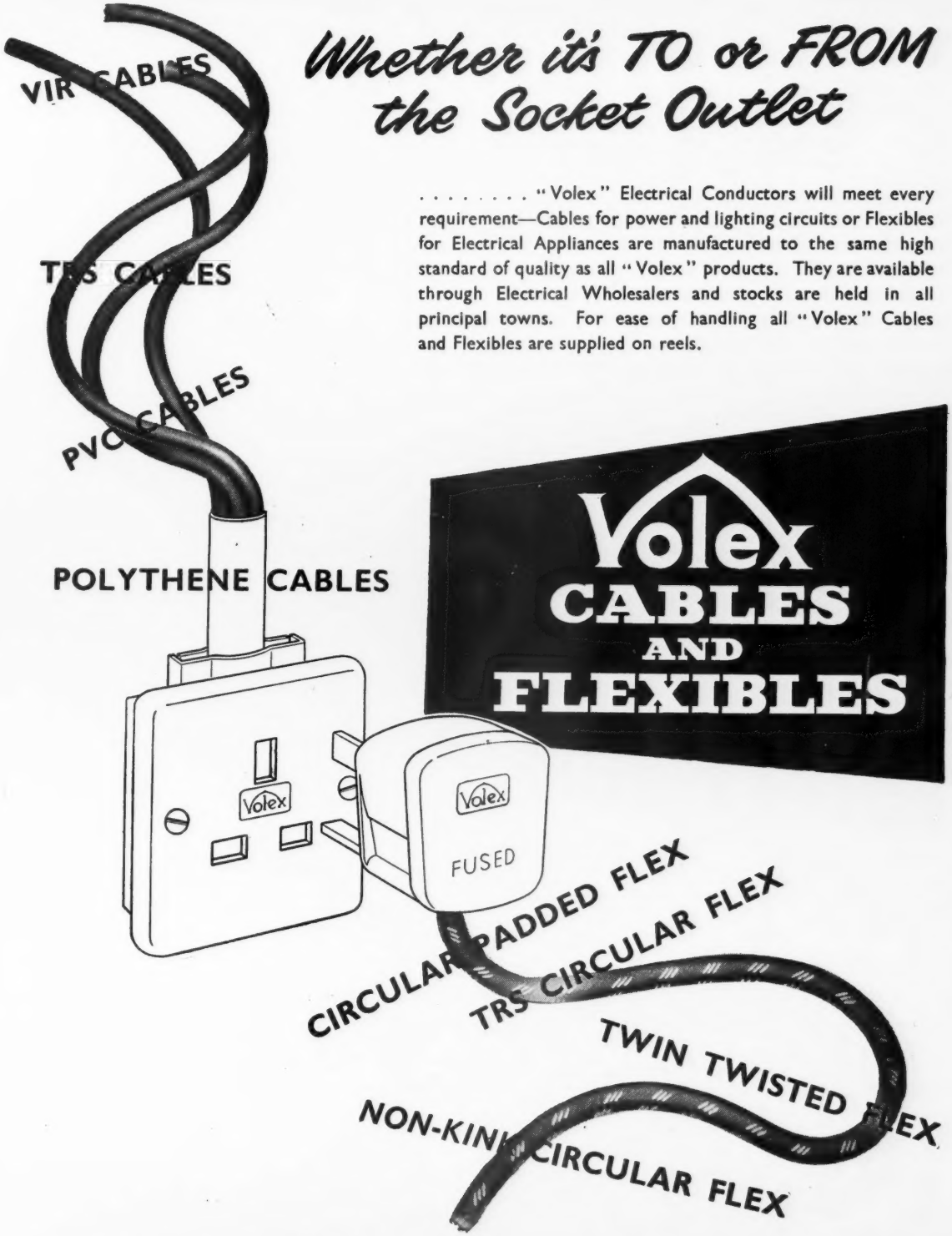
Standard range 1/33 h.p. to 15 h.p.

VARIABLE SPEED GEAR BY Kopp

Allspeeds Limited, *Oakenshore Works, Clayton-le-Moors, Accrington, Lancs. Telephone: Accrington 5441 (4 lines)*

with branches at . . .

LONDON: *59 Park Road North, Acton, W.3. Tel: Acorn 7150*
SCOTLAND: *P.O. BOX No. 1, Clarkston, Glasgow. Tel: Busby 2738*
MIDLANDS: *Much Park Street, Coventry. Tel: Coventry 63091*
YORKSHIRE: *46 Park Square, Leeds, 1. Tel: 3-1146, 3-0285/6*



Whether it's TO or FROM the Socket Outlet

. . . . . "Volex" Electrical Conductors will meet every requirement—Cables for power and lighting circuits or Flexibles for Electrical Appliances are manufactured to the same high standard of quality as all "Volex" products. They are available through Electrical Wholesalers and stocks are held in all principal towns. For ease of handling all "Volex" Cables and Flexibles are supplied on reels.

VOLEX ELECTRICAL PRODUCTS LTD
SALFORD 6

Telephone: PENdleton 4373 Telegrams: "VOLEXPROD", Salford 6

C
H

Shell Alvania Grease

for modern grease lubrication

SHELL ALVANIA GREASE, with its lithium hydroxy stearate base, and now with its new corrosion inhibitor, offers outstanding service for the majority of grease applications. It replaces the numerous conventional greases often used in the industrial and marine fields.

SHELL

LEADERSHIP IN LUBRICATION

SEWING -and GROWING

SALES EXCEED HALF A MILLION

Up and up go the sales of the Sew-tric Sewing Machine Motor–fast-growing popularity that proves its dependability, quality and low price appeal. Get a full share of this highly satisfactory, most profitable business—send now for full details.

Sew-Tric

SEWING MACHINE MOTOR

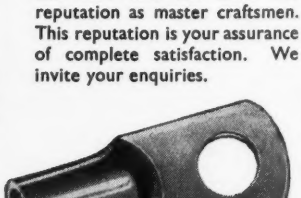
SEW-TRIC LTD · HONEYPOT LANE · STANMORE · MIDDX.

EDGware 5261-3

A WORD FROM YOU AND WE PUT ON THE PRESSURE

Not in the sense illustrated but in the production of fine quality pressings.

We manufacture precision presswork to any specification required, efficiently and with prompt attention. Every order is handled with the same interest and care that has built our reputation as master craftsmen. This reputation is your assurance of complete satisfaction. We invite your enquiries.



THE HAMPTON WORKS (STAMPINGS) LIMITED

PRESSWORK EXPERTS

TWYNING ROAD • STIRCHLEY • BIRMINGHAM

Telephone: KIN 2901 *Telegrams: RADIAGILLS, BIRMINGHAM*

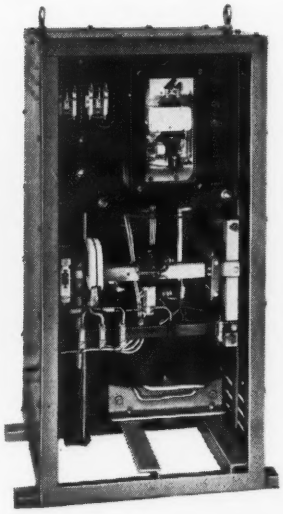
THE NELSON ENGINEERING CO. LTD.

specialized products for industry

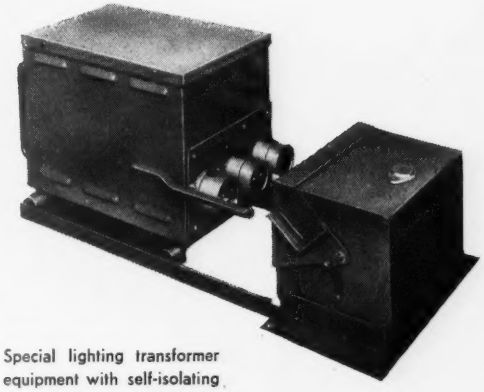
In addition to standard products, the Nelson Engineering Co. Ltd. manufacture specialized products for a wide range of manufacturing industries.
These products include special transformers, motors, control equipment, etc.

for

Power Stations, Paper Mills, The Textile Industry, Chemical Plants, Steel Works, Cycle Manufacturers, Machine Tools, Oil Installations, etc.
Other users include:— Food Manufacture and Processing, Gas Undertakings, Electricity Boards and the Mining Industry



Voltage regulating equipment, incoming voltage 230 volts, output voltage 450 volts stabilized within ± ½%.



Special lighting transformer equipment with self-isolating arrangement and interlocked safety barrier.

Equipment supplied includes:—

- Ward Leonard Equipment
- Special Rectifier Sets
- Battery Charging Equipment
- Induction Heating Transformers
- Welding Transformers
- Motors for special applications
- Voltage Regulating Equipment

THE NELSON ENGINEERING CO. LTD.
NELSON • LANCASHIRE

Telephone: Nelson 1545-6 *Telegrams: Nelson 1545*

LONDON OFFICE: 249 GRAND BUILDINGS, LONDON, W.C.2

Telephone: Trafalgar 4565/6

New & Secondhand PLANT & MACHINERY for prompt delivery from the LARGEST STOCKS in the country

page 600

STEAM DRIVEN GENERATING SETS

3,000 kW, 6,600/3/50 Pass out, Condensing Turbo Alternator Set by MET-VICK. Designed for 340 lb. W.P., initially 600° F. temp. Also suitable for the following duties:—

Output kW	*Pass out lb. hr.*	*Pressure*
3,000	60,000	40
1,800	40,000	110
1,800	40,000	110 and 40

Double Pass out at 1,000 kW fully condensing. Speed 1,000 r.p.m. through Reduction Gear.

1,800/2,000 kW Condensing or Pass out Turbo Alternator Set by MET-VICK. Steam pressure 250 lb.sq.in., 650° F. Speed 1,000 r.p.m. through Reduction Gear. Alternator 400/3/50.

1,000 kW Condensing Geared Turbo Alternator Set by ALLEN/E.C.C. for 400/3/50. Steam pressure 175 lb.sq.in., 600° F. exhausting to 29 in. vacuum. Speed 1,000 r.p.m. through Reduction Gear.

700 kW (875 kVA) Condensing and Pass out Turbo Alternator Set by G.E.C./FRASER & CHALMERS, for 6,600/3/50. Steam pressure 180 lb.sq.in. 420° F. Transformer 700 kVA. Available for stepping down to 400 v.

500 kVA Steam driven Generating Set by BELLISS & MORCOM/E.E.C. for 400/440/3/50. Steam pressure 140/150 lb.sq.in., 450° F. total temp. 25/26 in. vacuum exhaust, but has been adjusted for 150 lb.sq.in., with 10% overload, back pressure 15 lb.

400 kW (500 kVA) Steam driven Alternator Set by BELLISS/E.E.C. for 400/3/50. Steam pressure 130/165 lb.sq.in. 10/20 lb. back pressure. Speed 375 r.p.m.

200 kW (250 kVA) Steam driven Alternator Set by BELLISS/MATHER & PLATT for 400/3/50. Designed for 293 b.h.p., with steam at 150 lb.sq.in. pressure, superheat 420° F. total temp. Suitable for 5-25 lb.sq.in. back pressures.

250 kW Steam driven Generating Set by BELLISS/L.D.C. for 220 volts D.C. Steam pressure 115/135 lb.sq.in. 15 lb. back pressure. Speed 425 r.p.m.

170 kW (220 kVA) Steam driven Alternator Set by BROWETT/B.T.H. for 400/3/50. Designed to develop 260 b.h.p. with steam at 130 lb.sq.in. superheat 100° F., exhausting to vacuum, at 375 r.p.m., or could be adjusted to develop 150 kW with steam 160 lb.sq.in., 10 lb. back pressure.

150 kW Steam driven Generating Set by BELLISS/E.C.C. for 105 volts D.C. Engine develops 206 b.h.p., with steam at 155/160 lb.sq.in., 10/20 lb. back pressure at 400 r.p.m.

104 kW Steam driven Alternator Set by BROWETT/L.D.C. for 400/3/50. Engine rated to develop 135 h.p. cont., with dry saturated steam at 160 lb.sq.in., against 5 lb. back pressure, speed 600 r.p.m. Suitable for back pressures, up to 10 lb. with slight reduction in output.

75 kW Steam driven Generating Set by BELLISS/E.C.C. for 100 volts D.C. Engine rated to develop 110 h.p., plus 10% overload, with steam at 150 lb.sq.in., against 25 lb. back pressure, speed 400 r.p.m.

DIESEL DRIVEN GENERATING SETS

480 kW (600 kVA) Diesel driven Alternator Set by BRITISH POLAR ENGINES/ASEA, Engine vert., 5 cyl., 2 stroke, water cooled, type K35M, Speed 250 r.p.m. Cam controlled air starting acting on two cylinders. Reciprocating type scavenge Air Pump direct driven from crankshaft. Direct mounted reciprocating type cooling water circulating pump. Engine direct driving through solid coupling 600 kVA. Alternator, 440/3/50, 0·8 p.f., 787 amps., 250 r.p.m., Excitation 110 v., 124 amps. With Starting Compressor Set. Would consider rewinding for 600 kVA, 440 or 520v/3/60, 4 wire with the Engine at 300 r.p.m. or alternatively 220/3/60, 4 wire, with Engine at 300 r.p.m.

330 kVA Diesel Alternator Set by DAVEY PAXMAN/B.T.H. Engine 400 h.p., type 12 R.P.H., vert., 12 cyl., 4 stroke, water cooled direct coupled Alternator 380/440/3/50, 1,000 r.p.m.

260 kVA (208 kW) Diesel Alternator Set by MIRRLEES/B.T.H. Engine 300 b.h.p., vert., 7 cyl., 4 stroke, 600 r.p.m. Direct coupled Alternator 400/3/50, 0·8 p.f. with direct coupled Exciter.

Two Diesel driven Alternator Sets by CROSSLEY/B.T.H. Engine 330 b.h.p., type XVD6, 6 cyl., 4 stroke, 600 r.p.m. Direct coupled Alternator 420/3/50, 4 wire.

160 kW (200 kVA) Diesel driven Alternator Set by BLACKSTONE/E.E.C. Engine type E.P.V.6, vert., 6 cyl., 240 h.p., Direct coupled Alternator 400/3/50, 0·8 p.f. with flange mounted Exciter. Speed 600 r.p.m.

Three 150 kW (188 kVA) Diesel driven Alternator Sets by BLACKSTONE/L.S. & E. Engine type E.P.V.6, rated to develop 240 b.h.p., at 600 r.p.m. Direct coupled Alternator 400/3/50, 0.8 p.f., with direct coupled Exciter. With vert. Air Receiver 20 in. diam. x 5 ft. 6 in. and Engine driven Compressor.

Three 135 kW (169 kVA) Diesel driven Alternator Sets by CROSSLEY/BRUCE PEEBLES. Engine type QVD4, 200 b.h.p., 500 r.p.m. Direct coupled Alternator 415/3/50, 0.8 p.f., with Exciter.

118 kW (147 kVA) Diesel driven Alternator Set by MIRRLEES/L.D.C. Engine type ULA5, vert., 5 cyl., 4 stroke, rated to develop 168 h.p., 12 hr. duty. Direct coupled Alternator 400/3/50, 0.8 p.f., with Exciter. Speed 500 r.p.m.

115 kVA Diesel Alternator Set by RUSTON & HORNSBY/B.T.H. Engine VCR.5, vert., 5 cyl., 4 stroke, speed 600 r.p.m. Vee belt driving Alternator 440/3/50, 4 wire.

Four 55 kW (69 kVA) Diesel driven Alternator Sets by McLAREN BRUSH. Engine 88 b.h.p., vert., enclosed, 4 cyl., 4 stroke, radiator fan cooled, 1,000 r.p.m. Alternator 400/440/3/50, 0.8 p.f., with over mounted Exciter vee rope driven.

33.8 kVA Diesel driven Alternator Set by McLAREN/BRUSH. Engine M.3, Mark 2, 44 h.p., vert., 2 cyl., 4 stroke, radiator fan cooled, 1,000 r.p.m. Alternator 400/3/50, 0.8 p.f.

15 kVA Diesel driven Alternator Set by LISTER/MAWDSLEY. Engine 27 h.p., vert., 3 cyl., 4 stroke, radiator fan cooled, 1,000 r.p.m. Alternator 230/1/50, with integrally coupled Exciter.

THE 600 GROUP OF COMPANIES

GEORGE COHEN SONS AND COMPANY LIMITED

And at KINGSBURY (Nr. TAMWORTH) · MANCHESTER · GLASGOW · SWANSEA
NEWCASTLE-ON-TYNE · BELFAST · SHEFFIELD · SOUTHAMPTON · BATH

WOOD LANE, LONDON, W.12
Telephone: Shepherds Bush 2070
Telegrams: Omniplant, Telex, London

STANNINGLEY, Near LEEDS
Telephone: Pudsey 2241
Telegrams: Coborn, Leeds

D1/1

Aeroflex

ENERGY LIMITING

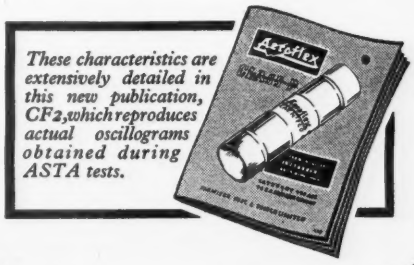
CARTRIDGE FUSES TO CLASS P

This new range of Aeroflex Fuses (AD and FC type) Category 440 AC5 Class P - is fully interchangeable with the former patterns and is now supplied in all listed Fluvent Switch and Fusegear. They offer refinements in performance, primarily due to the following factors:-

TECHNICAL DATA

Publication CF2 deals extensively with the subject and affords interesting data. A copy will be forwarded gladly to enquirers and students.

These characteristics are extensively detailed in this new publication, CF2, which reproduces actual oscillograms obtained during ASTA tests.



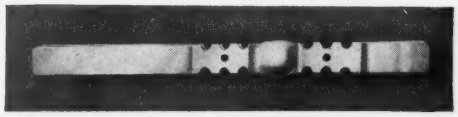
(1) The proved Breaking Capacity is raised from 33 to 46 K.A.

(2) The Energy Limiting is uniformly developed throughout the range.

(3) The fusing Factor is standardised at 1.25 throughout the range.

(4) The cartridge cases are ceramic instead of fibre.

(5) The end caps are fixed instead of being detachable as in the AF pattern, and re-wiring is normally carried out by returning blown cartridge fuse-links to the factory and not on site.



★ *The latest types of Aeroflex fuse element as employed in the AD and FC type Energy Limiting Fuses.*

Rewireability : Fuse Links are not discarded when blown —they can be returned for prompt replacement under our rewiring service scheme.

Parmiter Hope & Sugden Ltd

FLUVENT ELECTRICAL WORKS · LONGSIGHT · MANCHESTER 12

London : 34 Victoria Street, S.W.1. *Glasgow :* 5 Somerset Place, C.3. *Birmingham :* 39/41 Carrs Lane, 4.

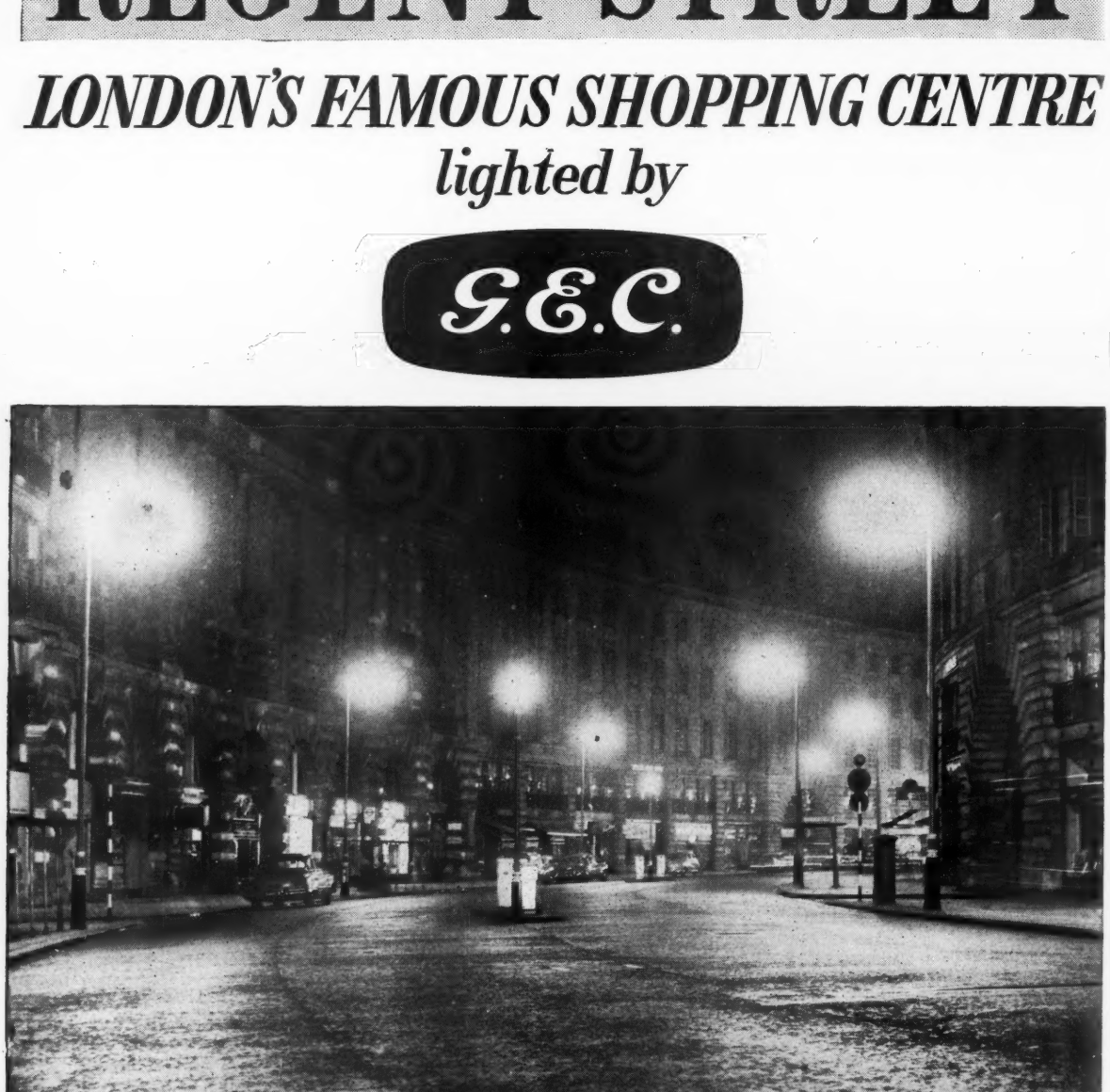
dm PH83

REGENT STREET

LONDON'S FAMOUS SHOPPING CENTRE

lighted by

G.E.C.



A. W. HOGG, Esq., B.Sc., A.M.I.C.E., M.I.Mun.E.,
City Engineer and Surveyor,
City of Westminster.

The General Electric Co. Ltd. was awarded this contract for the supply and erection of all the equipment and completed the installation, in collaboration with the London Electricity Board, in time for the switch-on.

This scheme for the City of Westminster which extends from Oxford Circus to Piccadilly Circus uses G.E.C. "Four-Eighty" lanterns each equipped with four 5 ft. 80 watt instant start Osram Warm White fluorescent tubes. The lanterns are mounted on steel columns fitted with ornamental cast iron bases specially designed for the City Council. Special post top "Four-Forty" fluorescent lanterns are used on the centre islands.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue and should be addressed to ELECTRICAL REVIEW, Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

TORPOINT URBAN DISTRICT COUNCIL

Supply of Group "A" Lighting Equipment

TENDERS are invited for the supply and delivery in Torpoint of Steel Columns, Brackets, Lanterns, Chokes, Capacitors, etc., for street lighting purposes.

Specification, conditions of contract and tender forms may be obtained from Mr. W. Hogarth, Surveyor and Lighting Engineer to the Council, Council Offices, York Road, Torpoint.

Tenders, in plain sealed envelopes endorsed "Tender, Street Lighting," must be delivered to the undersigned not later than the first post on Saturday, 14th December, 1957.

The Council does not bind itself to accept the lowest or any tender.

H. J. TIMBRELL,
Clerk of the Council.

Council Offices,
Torpoint, Cornwall.
15th November, 1957. 1381

COUNTY BOROUGH OF DERBY

Trunk Road Lighting

1. Ashbourne Road, A.52
2. Osmaston Park Road, A.5111

TENDERS are invited for the supply of Steel Columns, Brackets, Lanterns for 140-watt Sodium Lamps and gear, etc.

Tender documents, giving details of the two schemes, may be obtained from the Borough Engineer and Surveyor, Council House, Corporation Street, Derby.

Tenders must be delivered, in the addressed envelope provided, to the undersigned not later than 10 a.m. on Monday, 19th December, 1957.

G. H. EMLYN JONES,
Town Clerk.

Council House,
Derby. 1382

INDIA STORE DEPARTMENT

THE Director General, India Store Department, Government Building, Bromyard Avenue, London, W.3, invites tenders for the supply of :—

Further spares for Wireless Set No. 62.

Forms of tender, which are returnable by 2nd January, 1958, may be purchased at the above address at the cost of 10s., which is not returnable.

Reference No. 4632/56/BN/ET must be quoted on all applications. 1367

SITUATIONS VACANT

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER (Operation) required in the Crewe District. Salary within the range £790/£835 per annum (N.J.B. F.9).

Applicants should have had experience in the construction and operation of E.H.T., H.T. and L.T. overhead and underground distribution systems, including indoor and outdoor substation equipment. Technical qualifications desirable.

The appointment is subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham.

Closing date 4th December, 1957. 1394

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Central Gloucestershire Sub-Area

THIRD ASSISTANT ENGINEERS (Control) (Headquarters).

The successful applicants will be required to take charge of control operations of 11-kV, 33-kV and 66-kV systems on shift rota. Technical qualifications desirable. Salary £885/£930 per annum plus 10% shift allowance (N.J.B. Grade J.10).

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER (Dean Forest District).

Responsibilities will include contracting, electrical apparatus, radio, T.V., and refrigeration repairs. Applicants should have had experience in estimating for all classes of electrical installation work, the preparation of tenders, and specifications. A sound knowledge of installation practice with good commercial ability is necessary. Technical qualifications desirable. Salary £790/£835 per annum (N.J.B. Grade E.8).

Apply by letter, within fourteen days, stating age, experience, present position and salary to Mr. S. Raybould, Sub-Area Manager, Midlands Electricity Board, 126, London Road, Gloucester.

Wolverhampton and District Sub-Area

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER (Wolverhampton District).

Duties will include advising consumers regarding the use of electricity in industry. Technical qualifications desirable. Salary £935/£995 per annum (N.J.B. Grade H.8).

Apply by letter, within fourteen days, stating age, qualifications, experience and present salary to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 83, Darlington St., Wolverhampton.

Worcester and District Sub-Area

DRAUGHTSMAN (Stratford-on-Avon District).

The successful applicant will be responsible for drawing office and surveying duties in the district including the maintaining of all mains records. Salary £595/£715 per annum (N.J.B. Schedule D, Grade 6).

Apply by letter, within fourteen days, to Mr. R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

A. STEPHENS,
Secretary.
1387

WIGAN AND DISTRICT MINING AND TECHNICAL COLLEGE

APPLICATIONS are invited for a post as LECTURER IN ELECTRICAL ENGINEERING. Duties will commence on 1st January, 1958, or as soon after that as possible.

Candidates should hold a good degree and/or equivalent professional qualification and should be able to teach Electrical Engineering up to final degree and diploma standard. Experience of electrical engineering in the mining industry might be an advantage.

Salary in accordance with the Burnham Technical Scale for Lecturers (£1,200 - £30 - £1,350).

Further particulars and application form will be sent by the undersigned. Last date for receipt of applications, Monday, 2nd December, 1957.

E. C. SMITH,
Principal.

13th November, 1957. 1370

YORKSHIRE ELECTRICITY BOARD

Head Office

PRINCIPAL ASSISTANTS (Organisation and Methods).

Experience of O. and M. or work study is desirable though not essential. Applicants should have a degree or suitable professional qualification and considerable initiative. The group is based on head office (near Leeds) but staff may be required to work for short periods in any of the Board's sub-area or districts. Duties involve the examination and improvement of organisation and procedures and offer opportunities for gaining valuable experience of this type of work.

Salary N.J.C. Grade 9, £1,285/£1,405 per annum.
N.J.C. Grade 7, £1,035/£1,125 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Secretary, Yorkshire Electricity Board, Wetherby Road, Scarcroft, Near Leeds, not later than 6th December, 1957.

No. 7 (Grimsby) Sub-Area

THIRD ASSISTANT ENGINEER (Construction).

THIRD ASSISTANT ENGINEER (Operation and Maintenance).

Applicants should possess at least the Higher National Certificate in Electrical Engineering and should preferably be Graduate Members of the Institution of Electrical Engineers. They should have experience in the design, construction, operation and maintenance of H.V. and L.V. underground and overhead distribution systems, substation plant and ancillary equipment.

Salary N.J.B. Class J, Grade 10, £885/£15/£930 per annum.

THIRD ASSISTANT DISTRICT ENGINEERS.

Applicants should be of Higher National Certificate standard in Electrical Engineering and should have some experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, substation plant and ancillary equipment.

The posts are located as follows:—

Louth	—	2 posts.
Scunthorpe	—	1 post.
Grimsby	—	1 post.

Salary N.J.B. Class F, Grade 9, £790/£15/£835 per annum.

Gainsborough	—	1 post.

Salary N.J.B. Class E, Grade 9, £740/£15/£785 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 6th December, 1957. 1399

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of ENGINEERING DRAUGHTSMAN in the Central Sub-Area Drawing Office at Cardiff.

Salary Schedule D, Grade 6 (£595/£715) of the N.J.B. Agreement.

Applications stating age, present position and salary, qualifications, experience, and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, so as to reach him not later than Monday, 2nd December, 1957. 1339

Situations Vacant *(continued)*

GOVERNMENT OF QATAR (PERSIAN GULF)

Assistant Distribution Engineer

APPLICATIONS are invited for the appointment of an ASSISTANT DISTRIBUTION ENGINEER to assist the Distribution Engineer in the planning, construction and maintenance of H.T. and L.T. networks overhead and underground, substations, switchgear, etc., the supply voltage being 11 kV and 3.3 kV H.T. and 415/240 volts L.T.

Candidates must be in possession of at least a Higher National Certificate in Electrical Engineering, and preference will be given to those who hold an engineering degree or are Corporate Members of the Institution of Electrical Engineers. They should also preferably have had at least 10 years' experience with an electricity supply undertaking.

TERMS AND CONDITIONS OF SERVICE.

Probationary period of six months during which the contract may be terminated at three months' notice by the Government.

Contract for five years subject to successful completion of probationary period. The employee may terminate the contract by giving three months' notice in writing after completing one year's service.

The salary scale is from Rs.1,775 per month rising by annual increments of Rs.75 to Rs.2,000 per month, and then by increments of Rs.100 to a maximum of Rs.2,300 per month. The point of entry into the scale will be in accordance with the candidate's qualifications and experience.

A gratuity amounting to one month's salary for each completed year of service is payable on completion of contract only.

Free furnished bachelor accommodation, fuel, light and water. Married accommodation will be provided if desired as soon as it becomes available provided, however, that the Government retains the right to recover the cost of any passages for wife and family if the appointment is terminated within the probationary period.

Leave is earned at the rate of six days per completed month of duty and may be taken annually.

Free air or sea passages on first appointment, on leave and on final termination of contract are provided for applicant, wife and children up to 18 years of age.

An initial loan for the purchase of a car and running allowance are granted which fully cover the cost of running and depreciation.

Medical and dental treatment for the employee and his family are provided free.

A knowledge of Arabic would be an advantage and in any case the employee will be expected to apply himself to a diligent study of colloquial Arabic and to reach the standard of efficiency required by the Government regulations.

All calculations of pay and leave according to the Arabic calendar in force in Qatar.

Applications endorsed "Assistant Distribution Engineer, Qatar," accompanied by full personal particulars, including age, education, qualifications, experience, religion and past employment, should be made in writing within 14 days of the date of this advertisement to Preece, Cardew & Rider, 8, 10 & 12, Queen Anne's Gate, Westminster, London, S.W.1. 1371

ELECTRICAL ENGINEERS (SENIOR GRADE)

required by the ELECTRICITY AUTHORITY OF CYPRUS for two tours each of two years, with prospects of permanency.

Salary (including bonus and overseas and temporary allowances) in scale £2,054 rising to £2,265 a year. Superannuation scheme and medical fund. Outfit and settling-in allowances totalling £35 (£75 if accompanied by wife). Free passages and furnished quarters. Children's educational grants in certain circumstances. Liberal leave on full salary.

Candidates must have had sound training in both electrical and mechanical engineering, with experience in charge of District or equivalent, and have competent knowledge of operation, maintenance and development of underground and overhead systems up to 11 kV.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/41525/EF. 1397

NORTH EASTERN ELECTRICITY BOARD

Area Board Headquarters

APPLICATIONS are invited for the appointment of FOURTH ASSISTANT ENGINEER, Chief Engineer's Department, Construction Section, Carliol House, Newcastle up Tyne.

Applicants should be familiar with substation design and installation work and have experience in checking diagrams of connections for switchgear and auxiliary plant, and be able to assist with handling of contracts for 66-kV and lower-voltage equipment. Applicants must possess H.N.C. in Electrical Engineering.

Salary Schedule B, Grade 6, £710/£910. N.J.B. conditions of service.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 1398

WESTERN REGION PRODUCTION DEVELOPMENT BOARD (NIGERIA)

THE Board invites applications from suitably qualified persons for the following vacancy :—

CLERK OF WORKS (Electrical).

Scale of salary £660, £700 × £42 to £868 ; £902, £944 × £42 to £1,070.

Point of entry in the salary scale will depend on qualifications and experience. Inducement allowance £180-£300 per annum is payable to successful expatriate candidate.

QUALIFICATIONS :

Candidates must have one of the following qualifications :—

(a) City and Guilds Final Certificate in Electrical Engineering Practice.
(b) Full Technological Certificate in Electrical Installation Work.
(c) Ordinary National Certificate in Electrical Engineering.

Candidates should have served a full apprenticeship followed by at least two years' practical experience.

DUTIES :

The selected candidate will be responsible, under the general direction of the Chief Engineer, for the maintenance and servicing of small electrical lighting and power plant, switchgear, air conditioning, lift and telephone installations.

GENERAL TERMS OF EMPLOYMENT.

Outfit allowance of £60 for expatriate staff only ; free medical service, free passages for wife, also free passages once each way per tour for children up to three in number from birth to the age of thirteen ; up to 10% provident fund. Home leave on full pay at the rate of 5 days per month of overseas service ; normal length of tour 18/24 months ; partly furnished quarters provided at a rental of 8½% of officer's salary up to a maximum of £150 per annum.

The persons appointed may be required from time to time to tour widely in the Western Region of Nigeria.

METHOD OF APPLICATION :

Applications stating qualifications, age and experience, with names of three referees, should be forwarded to reach :

The London Representative,
W.R.P.D. Board,
18, Grosvenor Gardens,
London, S.W.1,

not later than the 7th of December, 1957.

Only applications of those selected for interview will be acknowledged.

1395

CENTRAL ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following vacancies in this Division :—

GENERAL ASSISTANT ENGINEER (Chemist),
LINCOLN POWER STATION
(Vacancy No. 204/57/ER).

Candidates must have had a sound technical training and some previous experience in an industrial laboratory and should hold the Ordinary National Certificate in Chemistry.

The duties will include the routine analysis of coal, water and oil, but the post offers opportunities of gaining general experience in the chemical control of power station operation.

Salary will be within the range £540-£680 per annum in accordance with the National Joint Board Agreement.

Closing date for receipt of applications, 4th December, 1957.

STATION CHEMIST,
COVENTRY POWER STATION
(Vacancy No. 205/57/ER).

Previous experience in a power station laboratory an advantage, and candidates should preferably be Associates of the Royal Institute of Chemistry or hold equivalent qualifications. The successful applicant will be required to take charge of the laboratory, the functions of which include the analysis of coal, oil, water and other substances, and the control of water softening plant.

Salary will be within Class G, Grade 7 (£935-£995 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 11th December, 1957.

SENIOR DRAUGHTSMAN (Civil),
GENERATION (CONSTRUCTION) DEPARTMENT
(Vacancy No. 159/57/ER).

Candidates should have experience in the preparation of detail drawings and in the design of one or more of the following subjects :—

Reinforced concrete structures.
Piled and slab foundations for heavy components.
Cable subways, bridges and culverts.

Salary will be in accordance with Grade 5 (£760-£860 per annum) or Grade 4 (£895-£995 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications, 11th December, 1957.

These appointments will be pensionable within the provisions of the Central Electricity Authority and Area Boards (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

L. F. JEFFREY,
Divisional Controller.

13th November, 1957. 1379

CENTRAL ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the post of:—

THIRD ASSISTANT ENGINEER
(Operation Research),
GENERATION OPERATION DEPT.
(S/13.969).

The work of the section involves investigation into engineering problems at generating stations throughout the Division and the application of specialised techniques in operational research to improve the effective use of plant and manpower.

Candidates should possess a suitable recognised qualification. Membership of a senior professional institution would be advantageous. Previous experience in operational research whilst desirable is not essential since opportunities for training will be given.

Salary N.J.B. AX/CX, Grade 6, £895-£1,080.

Special application forms obtainable only from P. D. A. Oliver, Divisional Secretary, Central Electricity House, High Street, Portsmouth, should be returned by 4th December, 1957.

1383

CENTRAL ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A/B. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

FOURTH ASSISTANT ENGINEER
(Efficiency and Testing),
CHIEF GENERATION ENGINEER'S (Operation) DEPARTMENT,
BARKING A/B POWER STATION
(Vacancy No. 57/1045).

Good technical education and experience in testing and/or operation of power station mechanical plant. Salary Class AX/EX, Grade 8 = £750/£985 p.a.

SHIFT CHARGE ENGINEER,
DEPTFORD EAST POWER STATION
(Vacancy No. 57/1046).

Practical experience in operation of power station plant essential. Character and ability to deal with staff problems essential. Salary Class K, Grade 7 = £1,210 plus £116 shift per annum.

ASSISTANT MAINTENANCE ENGINEER (Mechanical),
BARKING "C" POWER STATION
(Vacancy No. 57/1047).

Wide experience necessary in maintenance of modern generating plant and control of labour. Duties include organising and planning of overhauls of turbine and boiler plant and associated equipment. Salary Class J, Grade 8 = £1,045 p.a.

ASSISTANT SHIFT CHARGE ENGINEER,
FULHAM POWER STATION
(Vacancy No. 57/1048).

Applicants should have had sound engineering training followed by experience with large modern station plant. Salary Class K, Grade 9 = £1,045 plus £99 10s. shift p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Authority, London Division, P.O. Box 136, London, W.1, by 2nd December, 1957. 1349

FEDERATION OF RHODESIA AND NYASALAND

Federal Power Board

Appointment of Operations Controller

THE Board require the services of an OPERATIONS CONTROLLER who should be a fully qualified Electrical Engineer with wide knowledge of all aspects of the operation of electricity supply systems, including the commercial aspects, and who should possess executive experience.

The Board are at present constructing at the Kariba Gorge on the Zambezi a large dam and power station having an initial capacity of 500 MW and an ultimate capacity of at least 1,200 MW. The Board are also constructing about 930 miles of 330-kV transmission line to connect the Kariba power station with a number of thermal stations in the Federation. The Operations Controller is required in connection with the operation of this integrated system.

Salary £3,500 per annum. There is a pension scheme which the successful applicant will be required to join.

Applications should be posted so as to reach the Secretary, Federal Power Board, Reliance House, P.O. Box 630, Salisbury, Southern Rhodesia, not later than 31st January, 1958. 1297

CENTRAL ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule B. Salary includes London allowance.

QUANTITY SURVEYING ASSISTANT,
CHIEF GENERATION ENGINEER'S (Construction) DEPARTMENT,
DIV. H.Q., ERGON HOUSE
(Vacancy No. 57/1049).

Intermediate R.I.C.S. or equivalent with experience in interim valuations, measurements of contractors' work on site. Ability to drive car an advantage. Opportunity exists for "taking-off" on S.M.M. for building works under construction. Major programme civil engineering work in hand; opportunities to assist may occur. Salary Class AX/EX, Grade 7 = £860/£1,085 p.a.

Applications, quoting vacancy number, to (or on form from) Central Electricity Authority, London Division, P.O. Box 136, London, W.1, by 2nd December, 1957. 1350

MICHELIN TYRE CO. LTD.

Stoke-on-Trent

have progressive openings for

D.O. SECTION LEADERS

with at least G.I.Mech.E. and wide experience of general mechanical design and plant layout.

DESIGNER/DRAUGHTSMEN

(a) With H.N.C. and preferably thermodynamics endorsement, for interesting work in connection with works services—boiler plant, steam and hydraulic applications, pipework.

(b) With H.N.C. (Mechanical) and experience mechanical design of medium to heavy process plant. Some knowledge belt and chain conveyors desirable.

(c) With H.N.C. (Electrical) and experience in 3 of the following desirable: Motor and control gear application, A.C. and D.C.; E.H.T. and L.T. distribution; Lighting schemes; Substation design and layout; E.H.T. and L.T. oil and air brake switchgear.

Commencing salary according to qualification and experience.

Contributory pension scheme, free life assurance and excellent welfare facilities.

Assistance with housing will be given if required.

Please write in confidence to—

Mr. Glendenning, c/o above

quoting reference B/ER.

1372

BRITISH THOMSON-HOUSTON CO. LTD.

THE BRITISH THOMSON-HOUSTON Co. Ltd. has vacancies in its RESEARCH LABORATORY at RUGBY for ELECTRICAL ENGINEERS to join a group engaged in the development of improved insulating materials and processes for electrical machines. The work covers a wide and interesting field and includes the study of material properties, high-voltage phenomena, and the devising of realistic methods of assessing new insulation.

Applicants, who should have a degree or Higher National Certificate in Electrical Engineering and be free from National Service obligations, are invited to write to the Director of Research, The British Thomson-Houston Co. Ltd., Rugby, stating age, qualifications and experience, quoting reference SR. 1247

SOUTH EASTERN ELECTRICITY BOARD

Assistant District Engineers
within the Surrey Sub-Area

N.J.B. Class F, Grade 7.
Dorking and Epsom District: 1.
Sutton District: 1.

Salary £885 × £15 to £930 per annum plus, in the case of the Sutton appointment, London allowance. Superannuable.

Applicants should be Corporate Members of the Institution of Electrical Engineers or hold a Higher National Certificate in Electrical Engineering, and in addition should have had training and experience in the planning, construction, operation and maintenance of underground and overhead distribution systems, preferably up to 33 kV.

N.J.B. Class F, Grade 11.
Dorking and Epsom District: 1.
Sutton District: 1.

Salary £685 × £15 to £730 per annum plus, in the case of the Sutton appointment, London allowance. Superannuable.

Applicants, preferably of at least Higher National Certificate standard, should have had a sound training and experience in the construction, operation and maintenance of underground and overhead distribution systems.

N.J.B. Class K, Grade 13.
Surrey Engineer's Department: 1.

Salary £790 - £835 per annum. Superannuable.

Applicants, of at least H.N.C. standard, should have had a sound training in electrical distribution. Duties will chiefly consist of assisting in plant maintenance and the testing and commissioning of system protection. A knowledge of, or interest in, the latter would be an advantage.

Applications, naming two referees, on forms from C. W. Hughes, B.Sc., M.I.E.E., Surrey Manager, SEEBOARD, Rough Rew, Ridgeway Road, Dorking, Surrey, by 4th December, 1957.

A. L. BURNELL,
Secretary. 1393

THE REED PAPER GROUP

have a vacancy for

SHIFT ENGINEER

DUTIES: Responsible for operational running of power and boiler plants and Senior Engineer in charge of mill during off daywork periods.

Qualifications: Higher National Certificate (Engineering) or equivalent standard.

Age 30 - 40 years.

Experience: Industrial steam and power raising plant; knowledge of paper making an advantage.

Good commencing salary. Non-contributory pension scheme; canteen; sports club; assisted house purchase scheme.

Applications, in writing, stating age, qualifications and experience, to the Personnel Officer, Empire Paper Mills Ltd., Greenhithe, Kent, quoting ref. SE/2, before 6th December.

1326

SOUTH EAST ESSEX TECHNICAL COLLEGE AND SCHOOL OF ART

Longbridge Road, Dagenham, Essex

REQUIRED in January, or as soon afterwards as possible:—

LECTURER in Physics or Electrical Engineering (Light Current), mainly for classes in Electronics and Telecommunications Engineering for C.G.L.I. and H.N.C. courses. Candidates should hold a University degree in either Physics or Electrical Engineering with teaching and/or industrial experience.

Salary £1,200 × £30 to £1,350 plus London allowance (£36 or £48).

Details and application forms (stamped addressed foolscap envelope) from the Clerk to the Governors at the College. 1386

***Situations Vacant** (continued)*

NIGERIAN RAILWAY CORPORATION

THE NIGERIAN RAILWAY CORPORATION invites applications for the following post :—

ASSISTANT ELECTRICAL ENGINEER (Capital Works).

DUTIES : An Assistant Electrical Engineer will be required to take charge of minor capital works projects on the railway, responsible to the Electrical Engineer.

QUALIFICATIONS : Candidates should have experience of planning, construction and commissioning of (a) small diesel-engined power stations, (b) high-tension and low-tension distribution schemes with both overhead and underground systems, (c) workshop lighting and power schemes, (d) conduit wiring systems, (e) railway yard floodlighting schemes. A knowledge of water supply systems would be an advantage. They should preferably be Associate Members of the Institution of Electrical Engineers or possess a degree recognised as granting exemption from Parts I and II of the Institution of Electrical Engineers' examination, and have five years' suitable experience.

SALARY : In scale £800 × £50 per annum to £1,600 per annum plus £300 per annum overseas pay. Starting salary according to qualifications and experience. Appointments on contract with 20% gratuity per annum of total pay.

TOURS : 15 months in Nigeria followed by 15 weeks' leave on full pay.

QUARTERS : Partly furnished quarters are provided at low rental.

ALLOWANCES : There are attractive family, travelling, transport and other allowances.

Send postcard before 28th November, 1957, mentioning the post and this paper, for further particulars and application form to :—

The London Representative,
Nigerian Railway Corporation,
9, Northumberland Ave., London, W.C.2.
1324

ELECTRICAL ENGINEER
for
NUCLEAR GROUP

THE DE HAVILLAND ENGINE COMPANY LTD., invite applications for the above position.

Applicants who should be not less than 25 years of age, must have served an indentured apprenticeship in electrical engineering and be either a Graduate of the Institution of Electrical Engineers or hold a Higher National Certificate and have theoretical knowledge and practical experience in the following fields:—

A.C. and D.C. rotating machinery, switchgear, control gear and protective systems, industrial electronics and electrical installations.

Salary according to age, qualifications and experience.

Written applications only, quoting reference S.C.742 to

The Personnel Officer
THE DE HAVILLAND ENGINE COMPANY LIMITED
Leavesden, Watford, Herts.

1403

BRITISH KLOCKNER SWITCHGEAR LIMITED
Chertsey, Surrey

TECHNICAL SALES ENGINEERS required for London and Home Counties. Knowledge of motor control gear ; sales experience preferred but not essential. Apply giving full particulars to—Managing Director. 166

DEPARTMENT OF HEALTH FOR SCOTLAND

X-Ray Engineering Unit

Technical Officer Grade II (Engineering Assistant)

THE CIVIL SERVICE COMMISSIONERS invite applications from men for three pensionable posts. Headquarters in Edinburgh and Glasgow, but travelling involved. Duties include the preparation of wiring diagrams and installation supervision in connection with X-ray, electro-medical and sterilising equipment supplied to hospitals. Periodic visits of inspection are also made.

Age at least 25 on 1st October, 1957.

Candidates must have served a 5-year apprenticeship (or its equivalent) with an engineering concern giving a good comprehensive training. They must have had experience in the design, manufacture, installation and testing of X-ray and electro-medical apparatus. Possession of a National Certificate in Electrical Technology or a comparable qualification is desirable and membership of the Society of X-ray Technology an advantage.

Exceptionally, in lieu of the foregoing qualifications, evidence of lengthy experience in the X-ray and electro-medical industry and of very high technical attainment may be accepted.

Starting salary £720 (at 25) up to £845 (at 30 or over). Maximum £1,000. Exceptionally, starting salary above minimum may be granted.

Further particulars and application forms from Establishment Officer, Department of Health for Scotland (Room 30), St. Andrew's House, Edinburgh, 1.

Completed application forms should be returned by 9th December, 1957. 1272

WESTERN REGIONAL HOSPITAL BOARD, SCOTLAND

Assistant Engineers

APPLICATIONS are invited for two posts of ASSISTANT ENGINEER for electrical and heating duties respectively. Applicants should be Corporate Members of, or have attained the technical standard of Corporate Members of, the Institutions of Electrical Engineers or Heating and Ventilating Engineers respectively, and should have practical and theoretical experience of design, installation and operation and general maintenance, and should be capable of assisting in preparing specifications and estimates and advising generally on the classes of plant in their own particular field, viz.:—

(a) ELECTRICAL :
Electrical installation, including heating, lighting and power ; and

(b) HEATING :
Heating, ventilating, hot water, air conditioning, refrigerating, sterilising and pipe work installations in large buildings, laundries, kitchens, etc.

Salary scale £700 × £25 (3) × £30 (1) × £35 (6) to £1,015.

Starting salary may be above the minimum having regard to experience.

The successful applicants will be required to pass a medical examination and all appointments are subject to a deduction at the rate of 6% for superannuation.

Applications, giving particulars of qualifications and experience, together with the names of three referees, should be lodged with the Secretary, Western Regional Hospital Board, 64, West Regent Street, Glasgow, C.2, not later than 28th November, 1957. 1353

LONDON COUNTY COUNCIL

SOUTH-EAST LONDON TECHNICAL COLLEGE, as soon as possible, ASSISTANT GRADE B, to teach Electrical Engineering up to H.N.C. level. Ability to teach first year engineering drawing would be an added qualification. The College offers full-time "sandwich," part-time day and evening courses.

Salary £650 × £25 to £1,025 plus London allowance and additions for training and qualifications ; increments within the salary scale for experience.

Application forms from the College Secretary, Lewisham Way, London, S.E.4, to be returned by 6th December. (2110) 1337

CENTRAL ELECTRICITY AUTHORITY

Yorkshire Division

APPLICATIONS are invited for the following appointments in the Generation Construction Department, Leeds:—

(a) SENIOR DRAUGHTSMAN (Mechanical).

(b) SENIOR DRAUGHTSMAN (Electrical).

Salary for both appointments will be in accordance with the National Joint Board Agreement (Schedule D), Grade 5, £760-£860 per annum, according to qualifications and experience.

Candidates for (a) should have experience in one or more of the following:—

(i) Design and layout of power station equipment.

(ii) H.P. and L.P. steam and feed pipework, condensing plant and feed heating systems.

(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Candidates for (b) should have experience in the preparation of layouts and diagrams for the installation of switchgear, transformers, cabling wiring and general power station electrical plant.

Application forms obtainable from the Divisional Secretary (Establishments), Central Electricity House, St. Mary's Road, Leeds, 7, to be returned within 14 days of the appearance of this advertisement. 1385

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Northmet Sub-Area, Hertford District

FOURTH ASSISTANT ENGINEER (Ref. 721) (145/57.R.).

Candidates should have had a sound technaical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary N.J.B. Class F, Grade 11 (£685-£730).

Apply by letter to W. H. Hatton-Ward, Assoc.I.E.E., Manager, Eastern Electricity Board, Bridgefoot, Ware, Herts, by 2nd December, 1957.

Suffolk Sub-Area, Ipswich District

THIRD ASSISTANT ENGINEER (146/57.R.).

Candidates should have had a sound technical training nd suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems (including substations) in urban and rural areas.

Salary N.J.B. Class F, Grade 9 (£790-£835.)

Apply by letter within 14 days, to R. A. Jackson, A.M.I.E.E., A.M.I.A., Manager, Ipswich District, Eastern Electricity Board, Electric House, Ipswich, Suffolk Applications received in response to the previous advertisement, 130/57.R., will be re-considered. 1388

ALBRIGHT & WILSON (MFG.) LIMITED

require first-class tradesmen to work in its Oldbury factory. There are at present vacancies for:—

FITTERS
WELDERS
INSTRUMENT MECHANICS
ELECTRICIAN
CARPENTER

A merit rating scheme ensures good pay to good tradesmen and there are excellent canteen and recreation facilities available.

Applications in writing should be made to the

Labour and Welfare Officer (Oldbury)
ALBRIGHT & WILSON LIMITED
P.O. Box No. 3, Oldbury.

1389

IMPERIAL CHEMICAL INDUSTRIES LIMITED

Billingham Division

Electrical Inspector

AN Inspector is required to supervise contractors' work associated with the electrical and heating and ventilating installations in non-industrial buildings, such as offices, laboratories and amenity buildings at our Billingham factory, where work has started on several large contracts. The person appointed will be a member of the Construction Section of our Engineering Works and will be directly responsible to the Building Engineer.

Applicants should have served an apprenticeship and should possess a Higher National Certificate or its equivalent in electrical engineering. They should be in the age range 30-45. Previous experience on large non-industrial buildings as either inspector or clerk of works is essential.

The salary offered will be in accordance with the experience and qualifications of the successful applicant. All our staff join the pension fund and participate in the profit sharing scheme, and other conditions of employment are excellent. Married men are helped in the payment of removal expenses and are eligible for our assisted house purchase scheme.

Those interested should write, giving brief particulars of age, qualifications and experience, to the Staff Manager, Imperial Chemical Industries Limited, Billingham Division, Billingham, Co. Durham, quoting Ref. No. B/M/2. 1325

ESTIMATING ENGINEERS

opportunities with

'ENGLISH ELECTRIC'

STAFFORD

THERE are openings at Stafford for engineers with a knowledge of estimating comprehensive electrical systems and schemes involving control and switching equipment associated with generation and utilisation. Knowledge of steel mill applications would be an advantage.

The question of assistance with the accommodation problem and removal expenses will be discussed at interview (expenses paid).

Please write giving full details to

Central Personnel Services

336/7, Strand, London, W.C.2

quoting Ref. ER.1294C.

1348

COLOMBO PLAN

APPLICATIONS are invited by the Foreign Office for the post of SENIOR LECTURER IN ELECTRICAL ENGINEERING at the University of Rangoon, Burma. Will be required to teach electrical engineering up to degree standard and to set up high-voltage and electric machines laboratories. New buildings and up-to-date equipment being supplied under the Colombo Plan. Should preferably have a higher degree and must have had at least five years' experience of teaching and laboratory work at a British university. Should also have had experience of high-voltage practice. Will be expected to take up duties by beginning of next academic year, in June, 1958. Duration two years.

Salary £1,750 p.a. (subject to U.K. income tax) plus tax-free oversea allowance of £1,743 p.a. (married) or £913 p.a. (single) plus other allowances. Free furnished married accommodation provided. Contract with the U.K. Government.

For further information and application forms write Ministry of Labour and National Service (E9), Almack House, King Street, London, S.W.1, quoting A12/BUR/TCS/88. 1396

ELECTRICAL ENGINEERS AND DRAUGHTSMEN

required by progressive firm near Glasgow, manufacturing switchgear and control gear for medium-voltage A.C. systems in power stations, steel works, collieries, oil refineries and chemical works.

ELECTRICAL ENGINEERS: Two required, experienced in preparing specifications for substantial contracts and in developing schemes of control providing indication, interlocking and sequence as required. Graduate Engineers or men holding H.N.C. preferred; others having good practical experience and prepared to study to H.N.C. standard will receive serious consideration.

DRAUGHTSMEN: Two required, experienced in layout, design and preparation of manufacturing drawings and specifications. Men holding O.N.C. preferred; juniors with two years' drawing office experience and studying for O.N.C. also considered.

Unusual opportunities for advancement for capable men. Salary dependent on past experience and technical qualifications. Excellent working conditions. Five-day week. Canteen. Contributory pension scheme, providing free life insurance.

Applicants should state qualifications, practical experience and salary desired.—Box 1249.

ENGLISH ELECTRIC

in

AUSTRALIA.

THE Company's Rocklea Works, Brisbane, which is undergoing considerable expansion, is to appoint a

CHIEF DRAUGHTSMAN

for their Electrical Drawing Office.

This is a senior appointment carrying a substantial salary and candidates should be capable of assuming complete control of the department, embracing such products as switchgear, transformers, industrial motors, generators and machinery for rail traction.

Interviews in England will be arranged for suitable applicants who have considerable drawing office experience and possess an H.N.C. in Electrical Engineering or equivalent qualification.

Please write giving full details of education and experience to Dept. C.P.S., 336/7, Strand, London, W.C.2, quoting Ref. ER.9999A.

1364

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT CONSUMERS' ENGINEER required at Bangor, in the Caernarvon District. Salary within range £635/£680 p.a. (N.J.B. E/11).

Applicants should have had an engineering training and experience in dealing with installation work, consumers' supply enquiries and general commercial duties.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, nr. Wrexham. Closing date 29th November, 1957. 1369

ASSISTANT DIESEL ELECTRIC MECHANIC

required by the FALKLAND ISLANDS GOVERNMENT for service in SOUTH GEORGIA in South Atlantic Ocean for one tour of 30 to 36 months in first instance.

Salary, according to age, in scale £420 rising to £540 a year. Free board and lodging. Free passages. Liberal leave on full salary.

Candidates must be able to repair and maintain diesel-electric (A.C.) generators up to 75 kW and to service electrical equipment.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/42430/EF. 1354

PORT OF LONDON AUTHORITY

THE PORT OF LONDON AUTHORITY invite applications for the position of ASSISTANT ENGINEER (Electrical) at a salary of £1,265 rising by annual increments to £1,715 per annum. Commencing rate according to age and experience.

Candidates, who must be British subjects and Corporate Members of the Institution of Electrical Engineers, should have served a recognised apprenticeship with one of the major electrical manufacturing firms and should have experience in the specification, installation, operation and maintenance of the electrical equipment of a dock or harbour undertaking or heavy industrial organisation, including H.V. and L.V. distribution systems, rectifying plant, A.C. and D.C. cranes and pumping plant, large lighting schemes and V.H.F. radio-telephony.

The successful applicant will be required to become a member of the Port Authority's contributory superannuation scheme. In certain cases existing pensionable service is transferable.

Application forms may be obtained from the Establishment Officer, Port of London Authority, Trinity Square, London, E.C.3. 1352

INSTRUMENT ENGINEER

required by large Oil Company for work in Middle East. Applicants should have served a full apprenticeship and possess H.N.C.

The man selected will be required to calibrate and repair all types of electrical instruments governing the generation of electricity and the protection of circuits, both single and three-phase, including protective relays of all types, kilowatt indicators, kilowatt hour meters, kilovar indicators, power factor indicators, voltage regulators and frequency meters. In addition he would be responsible for the calibration and repair of test equipment such as Avos, Meggers, Selectest, etc.

Service will be on three-year contracts with pensionable pay not less than £1,050 per annum plus large local allowance. Paid home leave with free passages every two years. Full furnished air-conditioned quarters at nominal rental. Bachelor preferred owing to shortage of married accommodation. Age limit 35.

Write giving full details, quoting No. 751, to Box No. 1293, c/o Charles Barker & Sons Ltd., Gateway House, London, E.C.4.

1355

BRUSH ELECTRICAL ENGINEERING CO. LTD.

Loughborough

have a vacancy for an

ELECTRICAL ENGINEER

of Higher National Certificate standard in the Electrical Machines Laboratories of the Research Division. Previous experience in the field of rotating electrical machines is desirable, although an enthusiastic and ambitious candidate with a good practical background would receive special consideration.

The successful applicant will be employed in our new research laboratories where working conditions are excellent.

Conditions of service include a generous non-contributory staff assurance scheme.

Applications giving particulars of past experience, qualifications, etc., should be addressed to the Chief Personnel Officer, Brush Electrical Engineering Co. Ltd., Loughborough, Leics., and should quote reference R.4996.

1417

NORTHERN REPRESENTATIVE

required by Transformer Manufacturers to cover electronic and allied industries. Applicants preferably under 35, should have sound technical background.

Satisfactory remuneration to right applicant. Superannuation scheme. Car provided.

Write giving details to:—

Sales Manager,

WODEN TRANSFORMER CO. LTD.

Moxley Road,

Bilston, Staffs. 1402

***Situations Vacant** (continued)*

CENTRAL ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following position :—

SHIFT CHARGE ENGINEER,
BRIMSDOWN "A"
GENERATING STATION.

Salary N.J.B. Class F, Grade 7, £885 × £15 to £930 per annum plus £50 per annum London weighting plus 10% shift allowance.

Applicants should have served an apprenticeship and obtained an Ordinary National Certificate in Mechanical and/or Electrical Engineering, or equivalent. Experience in the operation of generating station plant at high steam pressures is essential.

Applications, quoting reference No. 2/8612, stating age, details of qualifications and experience, to the Controller, Central Electricity Authority, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., by 30th November, 1957.

W. N. C. CLINCH,
Controller. 1322

ALUMINIUM LABORATORIES LIMITED,

a large research and development establishment, require for the Electrical Division :—

(1) TECHNICAL ASSISTANT to undertake design and test work on prototype electrical apparatus. Applicants, preferably aged 25/30, should possess B.Sc.(Eng.) or equivalent and should have had experience in design, test and manufacture of rotating machinery and transformers.

(2) TECHNICAL ASSISTANT to undertake design and test work on prototype electrical overhead line accessories. Applicants should have a specialist background experience on the design and installation of o/h lines schemes and should have Corporate Membership of the I.E.E.

Pension and life assurance scheme in operation.

Apply to : Personnel Officer,
Aluminium Laboratories Limited,
Banbury, Oxon. 1356

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

FOURTH ASSISTANT ENGINEER is required in the System Development Section of the Technical Department at Headquarters, Moseley, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 7, commencing at a point commensurate with qualifications and experience within the range £810-£935 per annum, ultimately rising to £1,035 per annum.

Applicants should have had experience either in the supply industry or with a switchgear manufacturer, and a knowledge of the calculations involved in the development and operation of power systems will be an advantage. Technical qualifications up to Graduate I.E.E. standard are desirable.

Apply, quoting the vacancy number 678MD, on form AE6, available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 3rd December, 1957. 1240

ELECTRICAL AND ELECTRONIC TECHNICIANS

are required at

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL

(a) to operate experimental research equipment;
(b) to maintain and develop electronic control apparatus;

for the

CONTROLLED THERMONUCLEAR REACTION PROJECT.

Electronic and electrical experience essential for (a); emphasis on radar or pulse equipment for (b). H.N.C. or similar qualification desirable.

SALARIES : £1,050 - £1,270 (a) and (b).
£875 - £1,050 (a) only.

Send POSTCARD for full details of posts, salaries, etc., to Recruitment Officer (985Y/48), A.E.R.E., Didcot, Berks. 1368

ENGINEERS FOR THE DEVELOPMENT OF RAILWAY SIGNALLING APPARATUS

SEVERAL ENGINEERS are required for work on signals, track apparatus, relays, relay racks, control panels, remote control systems, automatic train control, automatic control of marshalling yards, etc. Previous experience of this type of work is not essential, but for some of the positions a knowledge of electronics will be an advantage.

The minimum technical qualification required is the Higher National Certificate (or equivalent).

These positions are pensionable and based on Trafford Park.

Write for application form, quoting reference "C.10," to :—

The Personnel Manager
METROPOLITAN-VICKERS ELECTRICAL CO. LTD.
Trafford Park, Manchester, 17 1248

DESIGN ENGINEER

MOTOR CONTROL GEAR

ESTABLISHED manufacturing company requires engineer experienced in design of contactors and auxiliaries, capable of producing, if necessary from theoretical considerations, electrically and mechanically sound designs which accord with modern manufacturing techniques.

Wide knowledge of applications essential.

Senior position, carrying appropriate salary, etc.

Write, giving details of age, experience and qualifications, to—Box 1131.

THE GENERAL ELECTRIC COMPANY LIMITED

Witton, Birmingham, 6

A YOUNG engineer required for work on the design and development of industrial electronic gear and magnetic amplifiers.

A degree or a Higher National Certificate is essential, and some general electrical engineering experience would be advantageous.

Please apply with full particulars to the

STAFF MANAGER.

1400

INSTRUMENT MECHANIC

required for the maintenance and repair of a wide range of industrial instruments in a large chemical works. Candidates should preferably have served a recognised apprenticeship.

There is a merit-rating scheme in operation in the company, which ensures that good tradesmen will receive a high rate of pay. Canteen and excellent recreational facilities are available.

Applications in writing should be made to the

Labour and Welfare Officer (Oldbury)
ALBRIGHT & WILSON LIMITED
P.O. Box No. 3, Oldbury. 1390

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of ASSISTANT ENGINEER (Substations) in District 226 (Llanelly) in the West Central Sub-Area of the Board.

Salary Schedule F, Grade 7 (£885/£930) of the N.J.B. Agreement.

Applications stating age, present position and salary, qualifications, experience, and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, so as to reach him not later than Monday, 2nd December, 1957. 1338

CENTRAL ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following position:—

MAINTENANCE SUPERINTENDENT, COWES GENERATING STATION (S/13,968).

Applicants should have experience in the maintenance of modern generating station plant and be capable of controlling maintenance staff and supervising boiler and turbine overhauls. Preference will be given to those possessing qualifications leading to corporate membership of a recognised professional institution.

Salary N.J.B. E/6, £885-£930.

Special application forms, obtainable only from P. D. A. Oliver, Divisional Secretary, Central Electricity House, High Street, Portsmouth, should be returned by 4th December, 1957. 1384

CENTRAL ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 174/ER/57

APPLICATIONS invited for superannuable N.J.B. appointment of ENGINEERING DRAUGHTSMAN (Electrical) in the Drawing Office, Generation (Construction) Department, Divisional Headquarters.

Salary Schedule D, Grade 6, £595 × £20 to £715 per annum.

Candidates should be suitably trained, possess an Ordinary or Higher National Certificate, and have had some experience with switchgear, transformers or cables. Knowledge of protective gear will be advantageous.

Application forms obtainable from Secretary, South Wales Division, Central Electricity Authority, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 3rd December, 1957. 1351

ELECTRICAL GOODS BUYER

A LARGE Manchester Mail Order House has a vacancy for an ELECTRICAL GOODS BUYER.

The situation, which covers the domestic field, is a progressive one and offers scope to the right man. A thorough knowledge of this type of business is required and experience in mail order is desirable but not essential.

Please write giving full details to

Box 1328.

A.C. MOTOR DESIGNER

required by

MAVOR & COULSON LTD.

with experience on the design of totally enclosed machines up to 3,300 volts.

Applicants must be conversant with automatic control gear; knowledge of flameproof enclosures an advantage but not essential.

Sports and social activities; pension scheme and good working conditions.

State age, qualifications and experience by letter to the—

Personnel Manager
MAVOR & COULSON LTD.
47, Redan Street, Glasgow, S.E.

1291

MANCHESTER EDUCATION COMMITTEE

Newton Heath Technical College

REQUIRED a TEACHER of MATHEMATICS AND SCIENCE, preferably with experience in electrical subjects.

Salary, Assistants scale, Grade B, of the Burnham Further Education Report, 1956 (men £650 × £25 to £1,025, additions for graduateship and training). Starting salary according to teaching and trade experience.

Forms and particulars from Chief Education Officer, P.O. Box 480, Manchester, 3, returnable by 7th December, 1957. 1392

TECHNICAL ASSISTANTS GRADE II (ELECTRICAL)

required by the KENYA GOVERNMENT MINISTRY OF WORKS for appointment on contract for one tour of 36 to 45 months.

Salary, according to age and experience, in scale (including inducement pay) £813 rising to £1,173 a year. Gratuity at rate of £109/£158 a year. Outfit allowance £40. Free passages for officer and wife and assistance towards cost of children's passages. Liberal leave on full salary.

Candidates must have served apprenticeship with firm of electrical contractors and have at least 5 years' experience of wiring, cable jointing, overhead line work, the repair of electrical appliances, and general electrical maintenance work. They should also be able to instruct junior staff and trainees.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/42499/EF. 1323

SUDAN LIGHT & POWER CO. LTD.

Burri Power Station

CHARGE ENGINEERS required for service in Khartoum. Starting salary, including cost-of-living allowance, approximately £S1,500 per annum £S1 = £1 os. 6d.) plus free house with hard furnishings, free light and water, and the use of a car. There is no income tax in the Sudan. Generous leave allowances with free passages for officer and family to the U.K. The power station consists of two modern 5-MW steam turbo-alternator sets plus 12-MW diesel plant with a 10-MW turbo-alternator under installation.

Applications to be addressed to the Secretary, The Power & Traction Finance Co. Ltd., Queens House, Kingsway, London, W.C.2, and should reach him by 15th December, 1957. 1340

POWER STATION SHIFT ENGINEER

required by large oil company for service in Persian Gulf. Must have served apprenticeship with diesel engineers and have had running and maintenance experience of diesel alternators up to 1,750 kVA. Previous power station and load control experience an advantage.

Age limit 35. Bachelors preferred as no married accommodation available for first contract.

Emoluments over £1,500 p.a. (incremental) and at present no income tax; pension fund; paid home leave with passages.

Replies giving details, and quoting No. 517, to—Box No. 1285, c/o Charles Barker & Sons Ltd., Gateway House, London, E.C.4. 1327

THE GENERAL ELECTRIC COMPANY LIMITED

Witton, Birmingham, 6

A YOUNG engineer required with a degree or Higher National Certificate with endorsements for the design and application of protective gear and control relays.

Applicants should have experience of this class of work, or at least a sound knowledge of switch and control gear.

Please write with full details of qualifications and experience to the

STAFF MANAGER. 1401

WARD & GOLDSTONE LIMITED

require a

REPRESENTATIVE

to call on all manufacturers using their products in the London area. Salary, commission and expenses paid. Car provided. Applicants must have their own personal connections at top levels and must be fully conversant with the products they will be expected to sell.

Apply giving full details of experience, references, etc., to Mr. A. G. Jackson, Director, Ward & Goldstone Limited, 5, Percy Street, Tottenham Court Road, London, W.1. 1316

DRAUGHTSMEN WANTED

BICC LIMITED have the following vacancies for Draughtsmen in Central London :—

TRAINEE DRAUGHTSMAN, First Year Ordinary National Course.

DRAUGHTSMAN, with Ordinary National Certificate.

LEADING DRAUGHTSMAN, with Higher National Certificate.

Interesting work offering good prospects for advancement. Five-day week. Pension fund.

Applications in writing to Personnel Officer, British Insulated Callender's Cables Limited, Surrey House, Temple Place, London, W.C.2, reference L.13. 1341

Applications are invited by

THE BENJAMIN ELECTRIC LTD.

for a

DESIGNER OF INDUSTRIAL LIGHTING EQUIPMENT.

Knowledge of fabricating techniques, finishes, lamps and control gear desirable, but initiative and ideas equally important.

Apply Chief Technical Engineer, Brantwood Works, Tottenham, London, N.17. 177

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Lochaber Area

APPLICATIONS are invited for the post of CHARGEHAND ELECTRICIAN. Experience in the operation and maintenance of high-voltage substations would be an advantage. Terms of employment in accordance with National Joint Industrial Council for Electricity Supply Industry. Present rate 4s. 10½d. per hour.

Application forms obtainable from Area Manager, Area Office, Bank St., Fort William. To be returned not later than Thursday, 28th November, 1957. 1263

ELECTRIC MOTOR DESIGNERS

A.C. and D.C. DESIGNERS required by firm manufacturing motors, fractional to 500 b.h.p.

Replies in confidence, stating age, experience and salary expected, to :—

LAURIE & CO.

Employment Specialists

19, Basinghall Street, London, E.C.2 9198

BRITISH KLOCKNER SWITCHGEAR LIMITED

Chertsey, Surrey

ESTIMATOR for TECHNICAL SALES. Correspondence and capable of preparing control schemes involving automatic motor control gear. Experience essential.

CIRCUIT DIAGRAM DRAUGHTSMAN. Preferably experienced in preparing automatic control gear schemes.

Applicants to have O.N.C. (Electrical). Excellent opportunities with fast growing concern. Pension scheme. Apply to Managing Director, stating experience and present salary 165

ASSISTANT to chief engineer required by well-known accessory manufacturers situated in pleasant north country district. A wide scope exists covering general research and development work, both in respect of the company's existing and new products envisaged. Designing ability at the drawing board stage is important, and laboratory experience together with a knowledge of electronics would be an advantage. Pension scheme. Apply in confidence stating full details and salary required, to—Box 1304.

A CABLE works in North London has a vacancy for a male chemist. The work involves supervision of factory processes and laboratory investigation of production problems and new products. Applicants should be of Higher National Certificate or equivalent level of education and have completed military service. Replies giving age, qualifications and experience should be addressed to—Box ER.701, c/o 191, Gresham House, London, E.C.2. 1251

APPLICATIONS are invited for the position of senior transformer designer with a company in the North. Applicants should have experience in all aspects of design of transformers up to and including 20/30 MVA. Approximate salary £1,700 per annum for the position, which is permanent and progressive. Assistance will be given towards re-housing expenses. Apply, stating age and experience, to—Box 1218.

BOOK-KEEPER (male), experienced, capable of taking charge of accounts and ledgers for expanding branch; good opportunity for young, keen and accurate worker. Write stating age, experience and salary required.—Berkeley Elec. Eng. Co. Ltd., Vincent House, Vincent Square, London, S.W.1. 1219

BUYER required by firm of electrical and mechanical engineers. Full particulars, including age, experience and salary required, to—Browning's Electric Co. Ltd., Boleyn Castle, Green Street, Upton Park, London, E.13. 1158

CABLE jointer wanted. Used to H.T. and L.T. jointing. Also must have experience of general installation.—Box 1357.

CABLE jointers and mates required for employment in the London area. Must be good plumbers and experienced in voltages up to 11 kV, also live L.V. work.—Box 1173.

CANADIAN electrical company requires estimating and contract engineer for transformer and switchgear department. Location Montreal. Applications addressed to Box 1373 will be forwarded to Canada.

CHIEF electrical designer required for small and medium A.C. and D.C. machines. Apply, in confidence, giving details of age, experience and salary required to the Secretary, Bull Motors, Foxhall Works, Ipswich. 1231

CIRCUIT design draughtsmen required by company manufacturing industrial control equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middx. 273

C. MAURICE CONTRACTORS Ltd., civil end electrical engineers, require electrical engineer with experience of large cable laying, jointing and substation construction contracts for supervisory work. Apply in writing to General Manager, Lindsey Road, Bishop's Stortford, Herts. 1307

CONTRACTS engineer required for the installation and jointing of power cables, control of rough labour, and keeping as laid drawings on contracts in London and elsewhere. Must be prepared to travel. Good salary and conditions. Permanent employment.—Box 1134.

DESIGNER-draughtsmen (senior), experienced in design for production of small mechanical and electrical devices. S.E. London. Reply stating age, experience and salary required to Personnel Manager.—Box 1359.

DESIGNER draughtsman, leading firm of contractors London, has a senior appointment of wide scope and interest available to a first-class engineer able to design (and supervise site work) high-class electrical installations of all types. Good junior also required. Excellent prospects and salary. Write, experience, age and salary envisaged.—Box 1203.

DEVELOPMENT engineer for design of small electrical switches, components and other electro-mechanical devices. Please write advising experience to—D. C. Phipps, Director, Crater Products Ltd., St. Johns, Woking. 1330

DEWHURST & PARTNER Ltd. require technical estimator for preparing tenders in their estimating engineering department. Applicant must have good electrical engineering background and have basic knowledge of motor control equipment and its applications. The position is a senior one, and housing assistance will be given to successful applicant if necessary. Canteen facilities, pension scheme. Write giving age, experience, etc., to — Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middlesex. 274

***Situations Vacant** (continued)*

DESIGN engineer/draughtsman required to develop range of outdoor switchgear by company newly entering this field. Must be able to develop standard range of connectors and isolators and prepare special schemes after discussion with clients. Apply giving full details of experience, present position and salary to—Box 1329.

DRAUGHTSMAN (electrical) for contractor's office. Some design experience and working knowledge of electrical installations up to 33 kV advantageous. Ability to work on own initiative. Good salary and conditions including accident and sickness and contributory pension schemes. Write full details — Cable Jointers Ltd., 229, High St., Acton, London, W.3. 1342

DRIVER/storekeeper for electrical wholesalers.—Batt Electrical, 6, Dock Street, London, E.1 (Royal 5905). 1404

ELECTRICAL contractors require an estimating engineer with sound knowledge of industrial installations. Progressive position for suitable applicant. Reply in strict confidence giving full details of age, experience and salary required to—Electric House (Denton) Ltd., Law Street, Denton, Manchester. 9202

ELECTRICAL engineer assistants required, preferably with H.N.C. and experience in the design and layout of M.V. and H.V. distribution. Write giving particulars of age, qualifications, experience and present employment to—Rendel, Palmer & Tritton, Consulting Engineers, 125, Victoria Street, London, S.W.1. 1221

ELECTRICAL engineer-surveyor required by the Cornhill Insurance Company Ltd. in the Manchester area. Applicants must have winding shop experience and technical education to H.N.C. standard. Salary commencing £735 rising to £1,060 per annum. Pension scheme. Reply stating age and experience to Chief Engineer, P.O. Box 10, 57, Ladymead, Guildford, Surrey. 1331

ELECTRICAL engineer, young, qualified, required as assistant to works electrical engineer cement industry. Progressive post giving opportunity to gain experience of large installation. House with garage available. Write with full details to—Box Z.322, c/o Streets, 110, Old Broad Street, London, E.C.2. 1222

ELECTRICAL fitters and fitters' mates, experienced in erection of all types of metal-clad L.V. and H.V. switchgear up to and including 11 kV, and outdoor gear up to and including 33 kV, together with the essential secondary wiring and cabling; required for contract work in South-East England.—Box 1252.

ELECTRICAL laboratory engineers for investigation and development work on small electro-mechanical mechanisms. Experience in design for large production essential. The company, in S.E. London, is old-established and expanding its activities. Reply stating age and salary required to Personnel Manager.—Box 1360.

ELECTRICIAN-fitters with experience in armoured cables, A.C. motors and industrial switchgear work, willing to travel London area. Write stating age and experience.—E.M.F. Ltd., 72, Farm Lane, Fulham, London. S.W.6. 1276

ELECTRONIC INSTRUMENTS Limited, Lower Mortlake Road, Richmond, Surrey, have vacancies for junior and semi-senior engineers with O.N.C. or equivalent experience for instrument final testing. These are staff positions offering interesting and varied jobs with a bright future in this rapidly expanding company. Five-day week. Pension scheme. Apply to the company giving qualifications and quoting reference TE/ER/N. 1405

ENGINEER required for interesting development and experimental work in connection with electrical fire protection. Good future prospects. North London district. Salary £750/£800 p.a.—Box 1306.

ESTIMATING engineer required for preparing tenders for A.C. and D.C. switchgear, open and enclosed pattern switchboards. Canteen facilities, pension scheme. Apply to—Whipp & Bourne Ltd., Switchgear Works, Castleton, Rochdale. 1374

ESTIMATING, process and method engineers for batch and quantity production of small electro-mechanical components. Progressive, well-established company in S.E. London. H.N.C. or equivalent. Reply stating age, experience and salary required to Personnel Manager.—Box 1358.

ELECTRO-mechanical draughtsmen required for production drawing office of company engaged in the manufacture of control gear equipment. Good salaries paid to "first-class" men. Canteen facilities, pension scheme. Housing assistance considered in approved cases. Write giving age, experience, etc., to—Personnel Officer, Dewhurst & Partner Ltd., Inverness Works, Inverness Road, Hounslow, Middx. 275

FOREMAN required in the Western Sub-Area of the Board to operate from Tenby. Experience in the installation and maintenance of H.V. and L.V. plant is essential. Salary £715 per annum inclusive of all overtime. Applications stating age, experience, present position and wage, should be forwarded to Mr. W. E. Richardson, Sub-Area Manager, South Wales Electricity Board, South Beach Pavilion, Tenby, not later than 27th November, 1957. 1406

HIGH-voltage plumber-jointers and mates, experienced in jointing all classes of cables up to and including 11 kV, required for contract work in South-East England.—Box 1253.

IN the New Year an assistant sales manager will be required for an electrical wholesale company in British West Africa handling radio, domestic appliances and installation materials. Duties will comprise the development of sales through retailers and contractors and wide experience in this field is essential. Practical experience and knowledge of servicing would be an advantage. Commencing salary will depend on qualifications and experience, but will not be less than £1,250 per annum, and there are good prospects for advancement. Free furnished accommodation and medical attention provided in Africa. There is a contributory pension fund and income tax is low. Tours in West Africa would be about 21 months and would each be followed by approximately four months' leave on full pay. Generous family allowances, free first class passages provided. Apply giving full particulars to—Box 1361.

INSTRUMENT mechanic with some electrical knowledge for the maintenance of industrial meters covering boiler and power plant and paper manufacture.—Bowaters United Kingdom Pulp & Paper Mills Limited, Thames Division, Northfleet, Kent. 1332

JUNIOR electrical engineer/draughtsman. Age 22/25. H.N.C. or O.N.C., experienced in estimating and contract work for mechanical handling plant. Pension fund, sports and canteen facilities. Particulars of experience, qualifications and salary to—W. J. Jenkins & Co., Retford, Notts. 1137

LONDON consulting engineers opening offices in Croydon require senior and junior engineers and draughtsmen for the design of electrical installations for buildings at home and abroad. Salary according to qualifications and experience. Write—Barlow, Leslie & Coombes, 5, Catherine Place, London, S.W.1. 1375

LONDON consulting engineers require electrical engineers for installation design for hospitals, commercial buildings, schools, etc. Write stating age, qualifications, experience and salary required to—Box 160.

M.T.E. CONTROL GEAR Limited require technical sales engineer manager for Greater London area. Must have sound technical knowledge in control gear and good existing business connections in the territory. Apply in writing to—Sales Director, Progress Road, Leigh-on-Sea, Essex. 1333

PACKER and receiving hand required by London N.1 electric light fittings mfrs. References required. For appointment 'phone NORth 4841. 9207

PRODUCTION engineer wanted for small electrical control gear works, Taunton, Somerset. State experience and salary required. —Box 353.

REPRESENTATIVE required in Devon by old-established electrical/radio wholesalers. Apply stating age and full details of past experience—Branch Manager, Simpson, Baker & Co. Ltd., 2/4, Smythen St., Exeter, Devon. 1343

SALES representative for S. Yorks and E. Lancs, etc., preferably already domiciled in triangle Leeds-Sheffield-Manchester. Electrically qualified and experienced to promote the sales of "Ashley" electric wiring accessories and, for associated company, "Astral" industrial switchgear and L.T. distribution equipment. Salary, commission, contributory pension, expenses, car and hard work provided. Health certificate required. Informative letters and photograph to Sales Director, Ashley Accessories Ltd., Ulverston, Lancs. Confidential consideration assured. 1311

SALES and service engineer required to join London staff of the leading packaged boiler makers in the U.K. No previous boiler experience is necessary as full training will be given at the company's works. Preference will be given to man with sound electrical background. Write in confidence giving details of previous experience to—Box 1407.

SALES manager required by firm of electrical and mechanical engineers manufacturing a wide range of special products. Full particulars, including age, experience and salary required, to — Browning's Electric Co. Ltd., Boleyn Castle, Green Street, Upton Park, London, E.13. 1159

SALESMAN required in London area for new electrical space heating system for commercial use with big prospects. Heating knowledge and practical experience asset. Write personal details to—Box 1362.

SENIOR or junior draughtsman required for work on electrical power resistors and heaters for industrial applications. Previous experience on this class of work is desirable but not essential. Apply giving details of experience, technical qualifications, age and salary required to—The Electrical Department of The Expanded Metal Co. Ltd., Stranton Works, West Hartlepool. 1376

SERVICE engineer required for inspection and maintenance of electrical equipment in the printing and newspaper industry, etc.—Box 1344.

SITUATION available for senior switchgear designer experienced in the general mechanical and electrical design work associated with high-power switchgear and circuit breakers up to 132 kV. Previous experience on the lines indicated preferable, but design experience on associated equipment will be considered. Applications giving age, education and full details of experience, together with salary required, to the Personnel Manager, South Wales Switchgear Ltd., Blackwood, Mon. 1408

SUPERVISING electrical engineer who aspires, with justification, to become contracts manager of medium-size London organisation, should write giving full details to—Box 1363.

SUPERVISING engineer required by electrical engineering and contracting co. for service in East Africa. Applicant must be able to prepare schemes and quotations for all types of installations, and preference will be given to applicants with knowledge of o.h. lines. Salary according to qualifications and experience. Apply Marryats E. A. Ltd., 40, Hatton Garden, London, E.C.1. 1409

SWITCHGEAR manufacturers require a young engineer to train with outside erection department on installation, testing and commissioning on site. Applicants, who should be of H.N.C. standard in electrical engineering, must have completed National Service, and be prepared to travel. Please give details of experience and qualifications, age and salary required to—Box 1345.

TELEPHONE engineer/mechanic, first-class, required, large firm engineers, 12 months' service overseas. Excellent opportunity. Write age, experience.—Box 1334.

TESTER of automatic electric control equipment required. Interesting work with good prospects. O.N.C. standard preferred. Five-day week, pension scheme, canteen facilities. Please write giving full details of age, previous experience, qualifications, etc., to—Personnel Officer. Dewhurst & Partner Ltd., Inverness Road, Hounslow, Middlesex. 277

TRANSFORMER designer/draughtsman, experienced with units up to 250 kVA. Salary commensurate with experience. Bonus and free housing accommodation to suitable applicant.—Stewart Transformers Ltd., 75, Kilburn Lane, London, W.10. 1312

WANTED for electrical consultant's dept. of large firm of architects in Bloomsbury (a) junior electrical engineer; (b) young electrical draughtsman, for installation schemes in large buildings. Apply, giving full details of education, training and salary required, to—Box 1313.

WINDING shop departmental foreman required by large firm in Eastern England manufacturing wide range of A.C. and D.C. rotating machinery. Applicant should have experience of modern H.T. and L.T. winding methods. Good salary, bonus and pension fund, and assistance in housing, to man with experience seeking interesting and progressive post. Applications will be treated in strict confidence. —Box 1236.

YOUNG electrical engineer required for training as assistant designer on special motors and other electrical equipment. Full particulars, including age, technical qualifications and salary required, to—Browning's Electric Co. Ltd., Boleyn Castle, Green Street, Upton Park, London, E.13. 1157

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

ELECTRICIAN, all-round, long experience power, lighting, first-class work, seeks position, jobbing, builders, contractors, maintenance, etc.—Box 9206.

TRAVELLER with London wholesaler, C.M.A, etc., seeks change. Turnover £35,000 p.a., mainly West London and western outskirts.—Box 9195.

WOULD any go-ahead concern care to offer an active appointment, not entirely office bound, in S., S.W. or S. Midlands of U.K. (not London) or abroad, to advertiser with B.Sc. 1st, D.F.H. g.m., Grad. I.E.E. and Mech.E. Experience power stations, etc., and nuclear engineering; design, contracts, construction, commissioning. Responsible, keen, aged 28. —Box 9204.

YOUNG R.E.M.E. officer, Grad. I.E.E., 8 years' experience in supply industry, seeks appointment in private firm, home or overseas.—Box 9192.

ARTICLES FOR SALE

CITY AND COUNTY OF KINGSTON UPON HULL

Disposal of Pumping Equipment

FOR SALE: A COMPLETE PUMPING UNIT OF INTEREST TO MAIN DRAINAGE AUTHORITIES. One 30" dia. Sewage Pump designed to pump 3,000 c.f.m. against 35-ft. head. Complete with 6,600/6,300-volt synchronous induction motor, control panel and oil circuit breaker suction and delivery valves, and automatic greasing equipment.

Also Electrical Components for electrically driven refuse collection vehicles by Electricars Ltd.

Further details and forms of tender obtainable from William Morris, O.B.E., City Engineer, Guildhall, Kingston upon Hull. Completed tender to be returned not later than 9.30 a.m. on Monday, 9th December, 1957.

1377

POLARISING EQUIPMENT FOR SALE

FOUR Processing Units, 200 m.a., 230 v., 3-phase. Each set comprises VARIAC control unit with fuses and metering, an oil 5.5-kVA H.T. transformer, 230 to 20,000 volts, and a Selenium rectifier assembly.

The Secretary
UNITED INSULATOR CO. LTD.
Oakcroft Road, Chessington, Surrey
(Tel. No. Elmbridge 5241-6) 1347

COMPRESSOR SETS FOR SALE

MODERN UNUSED 12-c.f.m., 200-p.s.i. w.p., fully automatic, receiver-mounted Compressor Sets by CURTIS / BROOK MOTORS.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12
(Tel. Shepherds Bush 2070) and
Stanningley, Nr. Leeds
(Tel. Pudsey 2241). 1177

100-kVA DIESEL ALTERNATOR SET

400/440/3/50

120-b.h.p. CROSSLEY-BRUSH, 600 r.p.m., water cooled, air start. A.V.R.

£700. O.N.O.

LESTER & HARRIS LTD.
Park Street, Coventry 9203

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., s/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

ABABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. 1/- Slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS from ½ to 675kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, generators, 1-100 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

BARGAINS in electric motors are always being obtained from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Stocks include A.C. and D.C. motors, second-hand and new up to 30 h.p. Starters, slide rails and pulleys. Ring Mon. 3355 for your requirements. 50

B.E.V. elect. bat. Forklift, 2-ton cap., 9-ft. lift, complete with bat. charger, guaranteed. View — Burleigh, Alpine Wks., Empire Way, Wembley (Phone 0211). 878

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (Ealing 3155/6). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards. — Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS, 110 and 220 v. D.C./230 v. A.C., .5 to 6 kVA; also A.C./D.C. Special voltages at short notice.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

COPPER wire. Single and double cotton, rayon or glass covered, gauges 16-31, on reels, well-known manufacture, to clear. Enquiries to—Edka Products Ltd., 384, City Road, London, E.C.1. 1412

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, control gear, transformers. A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

ELECTRICIANS. Send for details Shaftesbury lightweight "Bantam" ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

FLUORESCENT fittings, lamps, starters and control gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues. — The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FOUR 40-h.p. electric motors with reduction gears. Excellent condition. Full details from—Ralph W. Stewart & Co. Ltd., Elgin Works, Dunfermline, Fife. 1366

FRACTIONAL h.p. motors, new, ex stock, A.C./D.C., Universal, B.T.H., Delco-Remy, G.E.C., Fracmo, Newman, Scophony. — Jeary Electrical Co. Ltd., 5, Lamb's Buildings, London, E.C.1. 126

GENERATING plants, remote and M/F up to 10 kVA; also secondhand A.C. and D.C. sets up to 100 kVA, large stock all types. Special plants built at short notice.—Powerco Ltd., 312, York Road, London, S.W.18 (Tel. VAN. 5234). 151

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW. A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 161

HEAVY twin core cab tyre flex, 248/.018, by J. & P., carries 100 amps. Several hundred yards on drums, unused. Cheap. View—Burleigh, Alpine Works, Empire Way, Wembley (Phone 0211). 906

HOUSE service meters, C. & H., Aron, E.A.C., 20-240 v. A.C., s.-ph., 50 c., 2½ amps., 7s. 6d. each, 1s. 6d. postage; 5 amps., 17s. 6d. — Universal Electrical, 217-221, City Road, London, E.C.1. 37

LANSING Bagnall 2-ton elect. bat. powered pallet trucks, pedest. control, model PP, with chargers; 4 for sale. View—Burleigh, Alpine Wks., Empire Way, Wembley (Phone 0211). 879

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTORS, starters, circuit-breakers. Huge stocks of all types, ½ to 300 h.p. Stock list or quote by return.—J. S. Ramsbottom & Co. Ltd., Bow St., Keighley (3774-5-6). 70

NAMEPLATES, engraving, diesinking, stencils. — Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

OVERHEAD line plant. One Starloc 100-ton chassis-mounted hydraulic jointing compressor, completely overhauled by makers. Now in "as new" condition. Available inspection London area.—Box 1411.

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading. — Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. or D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters. —Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings. 57s. 6d. each subject. — F. W. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY Credit Meters, single & poly-phase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

SMALL BR screws and nuts in steel, brass and stainless steel, from stock.—Premier Screws & Repetition Co. Ltd., Woodgate, Leicester. 180

STEEL conduit, ¾" screwed, stoved enamel, B.S.S. 31, 1940, light gauge, electrically welded, brand new, approx. 7,000 ft. at 40s. per 100.—Tel. TERminus 8402 (London). 1413

Articles for Sale (continued)

ROTARY converters in stock, all sizes: enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 34

TELEVISION slotmeters & Time Switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

THE NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD has for sale a number of A.C. motors, mostly fractional, and other surplus equipment supplied for D.C./A.C. change-over, together with off-service distribution transformers, 11,000/200/230 volts. Offers are invited for all or any of these items, a list of which may be obtained from the Area Manager, North of Scotland Hydro-Electric Board, Perth City Area, Electricity Works, Shore Road, Perth. 1346

TWO Hackbridge-Hewittic transformer-mercury arc rectifier sets, with main switches. Input 400/440 v. A.C., 50 cycles, 3-phase; output 220 v. D.C. 80 kW and 20 kW. Both sets in excellent condition. Offers to — The Bursar, Downside Abbey, Stratton-on-Fosse, Bath. 1270

VARIOUS winding wires, D.C.C., Rayon and Lewmex, medium and fine s.w.g. Surplus to requirements.—Rotary Electrical Co. Limited, 40, Spring Street, Sheffield, 3. 1277

VENNER time switches, 200-240 v. A.C./D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generator sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 27

500-h.p. totally enclosed fan-cooled cage and slipring motor, 1,430 r.p.m., 530 V, with starter, fully guaranteed. Suitable for the mining industry offered at a greatly reduced price. Apply to—Edka Products Limited, 384, City Road, London, E.C.1. 1414

SALES BY AUCTION

Thirty-first Sale **E. R.**

By Order of the Secretary of State for Air

No. 25 MAINTENANCE UNIT, R.A.F., HARTLEBURY, WORCESTERSHIRE
(4 miles from Kidderminster, 11 miles from Worcester).

NOCK & JOSELAND

are instructed to Sell by Auction at the above Unit on

THURSDAY, 12th DECEMBER, 1957, at 10 a.m. prompt,

a Large Quantity of Valuable

MISCELLANEOUS STORES

including Clothing and Equipment, Parachutes and Dinghies, Rootes Group M.T. Spares, Footwear, Metal Fittings, Photographic Paper and Cameras, RADIO AND ELECTRICAL EQUIPMENT, General Stores, 20 Heavy 4-wheel Trailers.

VIEWING: The Rootes Group M.T. Spares are on view at No. 216 M.U. R.A.F., Sutton Coldfield, on Monday, Tuesday and Wednesday, 9th, 10th and 11th December, 1957, between the hours of 10 a.m. and 4 p.m.

The remainder are on view at No. 25 M.U. R.A.F., Hartlebury, on Wednesday, 11th December, 1957, between the hours of 9 a.m. and 4 p.m., and on the morning of the Sale Day between the hours of 8 and 11 a.m.

Admission by Catalogue only, price Sixpence each (postal orders, NOT stamps), which can be obtained from the Auctioneers,

NOCK & JOSELAND,
Bank Buildings, Kidderminster
(Tel. 2053 and 4211) 1410

EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW diesel or petrol, stationary or mobile, sale or hire. 24-hr. breakdown service. — Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

RELIABLE, self-contained diesel electric generating sets for hire, 2.5 to 260 kW. Night and day maintenance service. Quotations by return. — Whitetrade Limited, Rochester, Kent (Tel. Chatham 4638/9). 294

ARTICLES WANTED

BRADLEY Redundant Electricals, 74, Eversleigh Rd., London, E.6 (Phone GRA. 2750). London leading clearing house for all redundant electrical stock and equipment, A.C. and D.C. motors, generating plants, welders and diesel sets. Complete factories bought and dismantled if required, also small or large stocks of scrap cable (dismantled if required). Estimates given. 185

CENTURY repulsion induction, single-phase, 220/440-v. electric motors from 15 to 40 h.p. wanted. Burnt out, or motors needing repairs entertained.—Box 1124.

HARRINGTON & Sons, reclamation contractors, want redundant A.C./D.C. electric motors and transformers, stocks of cable, etc. — 109, Beaconsfield Street, New Beckton. East Ham, London, E.6 (ALB. 1388). 315

SURPLUS laminations, enamel copper wire. screws, nuts, flex. Good prices paid. Full details to—Box 199.

SURPLUS stocks of all types of domestic electric appliances wanted for prompt cash. Large funds available.—Spears, 14, Watling St., Shudehill, Manchester (Phone, Blackfriars 1916) (Bankers, Midland Bank Ltd.). 338

WANTED at clearance prices: 4,000 yards 19.083 V.I.R.; 4,000 yards 19.064 V.I.R.; 2,500 yards 7.064 V.I.R.; 1,500 yards 7.044 V.I.R.; 6,000 yards 7.029 V.I.R.; 1,000 yards 19.064 bare copper; 1,200 yards 7.036 bare copper; 3,000 feet 4 in. × 4 in. or slightly larger electrical trunking; 50 Niphan 4-pin sockets and plugs, 25 amp.—Box 1415.

WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 13

WANTED for prompt cash, ferrous and non-ferrous scrap, also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. & H. Cooper Ltd., 176, Brady St., Bethnal Green, London, E.1. 120

WANTED, rotary converters, any sizes.—Universal, 221 City Rd., London E.C.1. 35

WANTED, surplus stock cable, all types and sizes. We can inspect.—Box 220.

WANTED, 15-kW Redifon or Radyne type E.C.H. unit. Input 400 volts, 3-phase, 50 cycles. Output 0.45 meg-cycles.—Whitefield Machinery & Plant Limited, Cobden Street, Salford, 6 (Tel. Pen. 4746). 1178

X-RAY testing equipment wanted for the examination of small mass produced items. —Box 1335.

WORK WANTED AND OFFERED

A.C. and D.C. motor rewinds and repairs. Prompt service, fully guaranteed.—Edgware 5566/9; Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. 92

METALWORK. All types cabinets, chassis, racks, etc., to your own specifications. Write—Dept. 'S,' Philpott's Metal Works Ltd., Chapman Street, Loughborough. 211

SMALL armature, stator, transformer and general coil winding undertaken on production run.—Kensal Electrics Ltd., 151, Kensal Rd., London, W.10 (LAD. 4530). 202

AGENCIES

AGENT, A.M.I.E.E., M.A.M.E.Mech.E., having connections with Electricity Board and N.C.B., available for additional agencies except cables and switchgear.—Box 9184.

MANUFACTURERS of quality fluorescent fittings, tubes, starters and control gear wish to contact quantity buyers, wholesalers, agents, etc., interested in purchasing in quantity at special low prices. Advertisers are interested in long or short term arrangements.—Box 213.

ONE of the best-known and well-connected representatives in the electrical and radio/TV trade in the North-West is opening out as freelance agent. Storage space, telephone, etc., available. Manufacturers of appliances, accessories, cables, etc., interested in representation in North-West England, North Wales and Northern Ireland are invited to write to—Box 9205.

PLASTIC cable manufacturers require live agents, Northern Ireland. Write details experience, agencies held, etc.—J. Day & Co., Harrow Manorway, Abbey Wood, London, S.E.2. 1365

BUSINESS OPPORTUNITIES

EXPORT PROBLEMS SOLVED

A LEADING Australian manufacturer of Scientific and Electrical Apparatus offers to United Kingdom manufacturers whose exports to Australia have been limited due to the Australian import licensing system the opportunity to have their products manufactured in Australia in whole or part to established designs.

They have a large sales organisation also, and could market throughout Australia and New Zealand as well as manufacture, if required.

Their 70 years of experience plus their technical knowledge in the scientific and electrical fields can be made available to you.

They manufacture such items as:—

Electronic equipment.
Transformers to high kV.
Scientific equipment.
Electro-medical apparatus.
General electrical.
Light mechanical equipment.

Replies will be treated in strictest confidence and should be addressed to "Australian Manufacturer," c/o Wm. Allison & Co. (Ldn.) Ltd., 5, Broad Street Place, Blomfield Street, London, E.C.2.

1380

MANUFACTURERS' representative, A.M.I.E.E., interested contacting manufacturer domestic electrical appliances. Large showroom.—Box 1336.

£15/£20,000 tax losses regd., elec. mfg. co. Write—Box 1416.

BUSINESSES FOR SALE AND WANTED

CONSULTING ENGINEER

wishes to dispose of Electric Lighting, Power, and Heating Practice. Established 35 years in East Anglia.

Sound Goodwill.

Capital required, about £5,000.

Work in hand at valuation.

Box 1378.

BUSINESS PREMISES

NEWMARKET URBAN DISTRICT COUNCIL

TENDERS for the lease of new shop on council housing estate invited by the Newmarket U.D.C. Maisonette above shop offered to successful tenderer at council house rent. For details apply—Clerk of the Council, Severals House, Newmarket. 1391

EDUCATIONAL

CITY & Guilds (Electrical, etc.) on "No Pass —No Fee" terms. Over 95% successes. For full details of modern courses in all branches of Electrical Technology send for our 144-page handbook. Free and post free.—B.I.E.T. (Dept. 12A), 29, Wright's Lane, London, W.8. 100

LEARN electrical engineering the practical way. Our new self-study course includes equipment on which experimental work can be carried out. Also courses for all professional examinations. Free brochure from E.M.I. Institutes, Dept. ER57, London. W.4 (Associated with H.M.V.). 318

ELECTRIC SHOCK

ALL MEN ENGAGED DIRECTLY OR INDIRECTLY IN ELECTRICAL WORK SHOULD KNOW THOROUGHLY A METHOD OF RESTORING VICTIMS OF ELECTRIC SHOCK

INSTRUCTION SHEET

based on the HOLGER NIELSEN System and specially prepared by the Editorial Staff of

ELECTRICAL REVIEW

Well illustrated and printed in colour to simplify essential actions

Obtainable from
PUBLISHING DEPT.
DORSET HOUSE
STAMFORD STREET
LONDON · SE1

The "ELECTRICAL REVIEW" Wall Sheet, 20 in. x 15 in., printed in red and black, is available on chrome art paper at 8d. each (by post 10½d.), mounted on cardboard and varnished 5s. (by post 6s. 6d.), printed direct on aluminium sheet and varnished 8s. (by post 9s. 6d.).

USEFUL BOOKS

ELECTRIC-MOTOR CONTROL GEAR: Starting, Protection and Speed. By J. L. Watts, A.M.I.E.E. Explains the principles underlying the construction and operation of the various types of apparatus. Since most electrical failures associated with motor drives originate in the control, this book is indispensable to all responsible for the installation, maintenance and safe performance of electric motors.
5s. net. By post 5s. 8d.

PRODUCTION ENGINEERING: Practical Methods of Production Planning and Control. By J. S. Murphy, A.I.I.A. Among the aspects discussed are: planning a production programme; drawing office organization; manufacturing processes; shop layout; control of production; time and motion study; estimating and costing. No attempt is made to specialize—the principles set out being applicable to widely varying types of industry.
12s. 6d. net. By post 13s. 5d.

DOMESTIC WATER HEATING. By Roland Grierson, M.I.E.E., M.I.MECH.E. A critical analysis of current practice in household hot water supply. Shows that the combination of an electric immersion heater with a storage tank and coal or coke-fired water-heater can be both economical and efficient. The whole theory and practice of domestic water heating is covered, including much data resulting from recent research into the subject. *25s. net. By post 26s.*

LAPLACE TRANSFORMS FOR ELECTRICAL ENGINEERS. By B. J. Starkey, DIPL.ING., A.M.I.E.E. A presentation of the theory of Laplace transformation in which a physical vocabulary rather than a purely mathematical one is used as far as possible. This method of analysis has become of increasing importance to electrical engineers in many fields, and the work is designed to provide a thorough treatment of the subject in a language with which they will be familiar. Published for "Wireless Engineer." *30s. net. By post 31s. 2d.*

PLASTICS PROGRESS, 1955. Full report of the third British Plastics Convention proceedings, including a full text of the papers, together with a record of the discussions which followed them. The subjects covered are: Polymer Structure and Properties; Expanded Plastics; Thermoplastics; Extrusion; Work Study; Injection Moulding; Patents; Foundry Resins; Glass Reinforced Plastics. *50s. net. By post 51s. 9d.*

ELECTRONIC COMPUTERS. By T. E. Ivall. A non-mathematical introduction to the mechanism and application of computers employing valves and transistors. Both digital and analogue computers are covered, the bulk of the book being devoted to describing their circuitry, while their rapidly developing applications in industry, commerce and science are also outlined. *25s. net. By post 26s.*

Obtainable from all booksellers or direct from:

THE PUBLISHING DEPARTMENT · DORSET HOUSE · STAMFORD STREET · LONDON S.E.1

INDEX TO ADVERTISERS

Agro Electrical Co. Ltd. 24
Aircraft-Marine Products (G.B.) Ltd. 35
Airsonic Ltd. 42
Allspeeds Ltd. 96
Alton Battery Co. Ltd. 4
Anders Electronics Ltd. 62
Appelbe, J. F., & Co. Ltd. 73
Arcolectric Switches Ltd. 78
Armstrong Siddeley (Brockworth) Ltd. 95
Ashley Accessories Ltd. 63
Associated Fire Alarms Ltd. 66
Atlas Lighting Ltd. 92
Avo Ltd. 1
Axon Motor Re-Winding Co. Ltd... 27

B.S.A. Tools Ltd. 91
Bakelite Ltd. 50
Belling & Co. Ltd. 12
Belmos Co. Ltd. 87
Benjamin Electric Ltd. 51
Berry's Electric Magicoal Ltd. 54
Birch, H. A., & Co. Ltd. 81
Birkbys Ltd. 13
Birmingham Mica Co. Ltd. 28
Birmingham Specialities Ltd. 62
Brentford Transformers Ltd. 67
Bridge, David, & Co. Ltd. 9
British Driver-Harris Co. Ltd. 2
British Insulated Callender's Cables Ltd. 41
British Klockner Switchgear Ltd.... 77
Brook Motors Ltd. 93
Brookhirst Switchgear Ltd. 70
Brown, N. C., Ltd. 46
Brush Electrical Engineering Co. Ltd. 6
Buck & Hickman Ltd. 28
Bullers Ltd. 57

Cayson Electrics Ltd. 82
Central Electricity Authority 68
Channel Conduits Ltd. 54
City Electrical Co. 116
Cohen, George, Sons & Co. Ltd. 26 & 100
Connollys (Blackley) Ltd. ..... 18 & 22
Consolidated Pneumatic Tool Co. Ltd. 25
Craig & Derricott Ltd. 34
Cressall Manufacturing Co. Ltd. ... 93

Daly (Condensers) Ltd. 82
Dane Electrical Controls Ltd. 15
Davey, W. C., & Co. 69
Dennis, G. P., Ltd. 60
"Diamond H" Switches Ltd. 56
Donovan Electrical Co. Ltd. 116
Drummond, John (Engineers) Ltd. 86
Duncan Low Ltd. 16

East London Mica Works 10
Electric Depôt Ltd. 90
Electrical Instrument Co. (Hillington) Ltd. 31
Electrical Remote Control Co. Ltd. 115
Electroway Heaters Ltd. 62
Engelhard Industries Ltd. 19
English Electric Co. Ltd. 39
Evershed & Vignoles Ltd. 16

Ferranti Ltd. 45
Fractional H.P. Motors Ltd. 62
Fuller Electric Ltd. 38
Furse, W. J., & Co. Ltd. 82

Gambrell Bros. & Co. Ltd. 58
General Electric Co. Ltd. Cover 4 & 102
Grubb Engineering Co. Ltd. 19

Hampton Works (Stampings) Ltd. 98
Harboro' Rubber Co. Ltd. 86
Hawke Cable Glands Ltd. 10
Hedin Ltd. 23
Henley, Burrowes & Co. Ltd. 86
Henley's, W. T., Telegraph Works Co. Ltd. 49
Higgs Motors Ltd. 21

Imperial Chemical Industries Ltd... 47
Ismay Lamps Ltd. 46

Jeary Electrical Co. Ltd. 66
Jelson Electric Ltd. 93
Johnson & Phillips Ltd. ..... Cover 3

Kelvin Norton Electric Co. Ltd. ... 58
Kenbar Electrical Co. Ltd. 62

Ladybird Appliances Ltd. 16
Lancashire Dynamo Nevelin Ltd. ... 61
Lee & Wilkes Ltd. 28
Legg (Industries) Ltd. 55
Litholite Insulators & St. Albans Mouldings Ltd. 77
Londex Ltd. 93
Lyons, Claude, Ltd. 90

M.K. Electric Ltd. 52
M. & R. 114
Macintyre, James, & Co. Ltd. 46
Magnetic Controls Ltd. 71
Mek-Elek Engineering Ltd. 74
Mercury Switch Manufacturing Co. Ltd. 28
Meritus (Barnet) Ltd. 15
Metropolitan-Vickers Electrical Co. Ltd. ..... 17 & 72
Metway Electrical Industries Ltd. 34 & 86
Midland Dynamo Co. Ltd. 81
Midland Electric Mfg. Co. Ltd. Cover 1

Midland Silicones Ltd. 79
Mole, M., & Son Ltd. 31
Mono Pumps Ltd. 85
Morris, John, Electrical Engineering Co. Ltd. 27

Nelson Engineering Co. Ltd. 99
Non-Ferrous Die Casting Co. Ltd. 64

Oddie, Bradbury & Cull Ltd. 73

Parmiter Hope & Sugden Ltd. 101
Parsonage, W. F., & Co. Ltd. 58
Partridge Transformers Ltd. 31
Partridge, Wilson & Co. Ltd. 29
Paxtons (Electrical) Ltd. 77
Philips Electrical Ltd. 27
Phillips Control (G.B.) Ltd. 42
Pinchin, Johnson & Co. 30
Pirelli-General Cable Works Ltd.... 65
Portable Furnace & Patents Co. ... 115
Presspahn Ltd. 42
Prichard, Hugh, & Co. (Nottm.) Ltd. 86
Pyrotenax Ltd. 32

Rawlplug Co. Ltd. 76
Reyrolle, A., & Co. Ltd. 48
Rista Wires & Cables Ltd. 88
Rotunda Ltd. 74
Rowlands Electrical Accessories Ltd. 20

Sanders, W., & Co. (Wednesbury) Ltd. 3
Sangamo Weston Ltd. 8
Scemco 81
Service Electric Co. Ltd. 116
Sew-Tric Ltd. 98
Shell-Mex & B.P. Ltd. 98
Siemens Edison Swan Ltd. Cover 2, 36, 37 & 85
Sifam Electrical Instrument Co. Ltd. 58
Simmonds Bros. 114
Simmonds & Stokes (Niphan) Ltd. 115
Simplex Electric Co. Ltd. 43
Simplifix Couplings Ltd. 40
Small Electric Motors Ltd. 34
Smith, Frederick, & Co. 94
Souplex Ltd. 116
South Wales Switchgear Ltd. 11
Spicers Ltd. 84
Standard Telephones & Cables Ltd. 75
Steels Engineering Products Ltd. ... 83
Sturdy Electric Co. Ltd. 15
Sturtevant Engineering Co. Ltd. ... 7
Sutcliffe Speakman & Co. Ltd. 73

T.M.C.-Harwell (Sales) Ltd. 80
Taylor, S., & Co. Ltd. 89
Telco Ltd. 82
Termination Equipment Co. Ltd. ... 42
Tetra Engineering Co. Ltd. 90
Thermostatic Controls Co. 78
Transformer & Electrical Co. Ltd. 85
Transformers & Rectifiers Ltd. 69
Tufnol Ltd. 5

Universal Electrical Co. 90
Utilities (London) Ltd. 40

Vactric Ltd. 14
Varilectric Ltd. 55
Vernier Manufacturing Co. Ltd. ... 71
Vernons Industries Ltd. 59
Volex Electrical Products Ltd. 97

Wandleside Cable Works Ltd. 114
Washers Ltd. 116
Weekes, L. (Luton) Ltd. 9
Westminster Engineering Co. Ltd... 81
Wiggin, Henry, & Co. Ltd. 44
Wilcox, Edward, & Co. Ltd. 56
Wootton & Co. Ltd. 23

Zenith Electric Co. Ltd. 24

Advertisement copy and blocks for printing in black and white should reach us 16 days preceding date of issue addressed to Electrical Review, Dorset House, Stamford Street, London, S.E.1

Do you know?

BRONTE

ELECTRIC BLANKETS

retail at 50/- each

4 new pastel colours, rose pink, blue, green and gold. Complete with switch and 6 ft. lead. Cellophaned and boxed. Size 50 x 26. 24 months' guarantee.

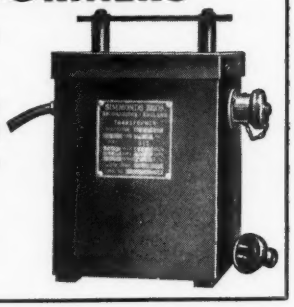
Send for illustrated brochure to sole makers :—

M. & R. 2 Earl Street, BRADFORD 5
Telephone : 24992

VOLTAGE DROPPING TRANSFORMERS

For Electric Tools on 110 volts

Full range of fixed and portable types in all capacities, or made to specification. *List free*



SIMMONDS BROS. STOURBRIDGE

NOT — just cable — ***BUT***

CABLE of *Quality*

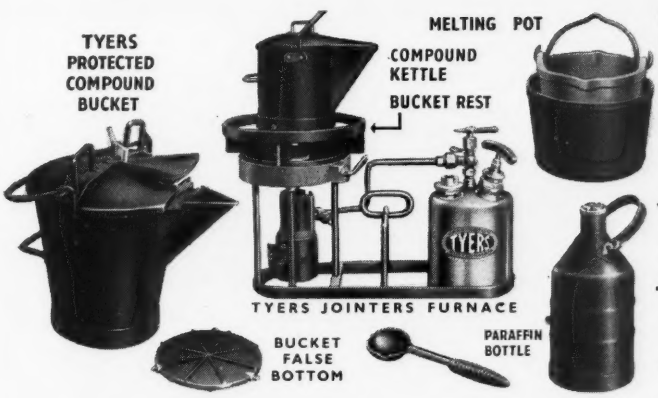
WANDLE BRITISH MADE CABLE

V.I.R. Taped and Braided; Tough Rubber; Lead Covered and Flexibles

WANDLESIDE CABLE WORKS LTD.

106 Garratt Lane ✦ Wandsworth ✦ London ✦ S.W.18

Telephone: BATtersea 2273 (5 lines) *Telegrams: "Wandleside, London"* *London Office: 21 Fitzroy St., W.1 LANgham 8317*



TYERS JOINTERS EQUIPMENT

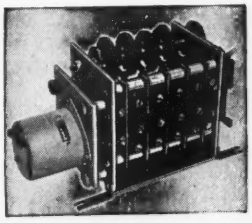
for Dependability

The only choice in 1885... Still the BEST today!

PORTABLE FURNACE AND PATENTS CO.

CARRINGTON NOTTINGHAM

Telephone 64887 Telegrams 'FURNACE NOTTINGHAM'



Automatic Electrical Timing Equipment

Display Timers

Relays for AC and DC

Production Soldering Irons

ELECTRICAL REMOTE CONTROL CO. LTD.

HARLOW NEW TOWN, ESSEX

Telephone: Harlow 24032

WEATHERPROOF METAL-CLAD SOCKETS, PLUGS, SWITCH SOCKETS etc.

for all electrical purposes

SIMMONDS & STOKES (NIPHAN) LTD

MANUFACTURING ELECTRICAL ENGINEERS

Victoria House, Southampton Row, London, W.C.1. HOLborn 2163, 8637

STEELS

IN MODERN INDUSTRY

A Comprehensive Survey by 29 Specialist Contributors

General Editor W. E. Benbow, late Editor of IRON & STEEL. Specifies the steels best used in various engineering applications (bearing in mind the present need for economy), describes their general and special properties, and how they may be surface finished for anti-corrosive and other purposes. This work comprises 562 pages with 260 illustrations, and has a foreword by Dr. H. J. Gough, C.B., M.B.E., M.I.MECH.E. F.R.S.

42s. net. By post 43s. 9d.

Obtainable from all booksellers or direct by post from Iliffe & Sons Ltd. at the address below.

DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1

DOMESTIC WATER HEATING

Basic Engineering Principles of Electric and Solid-fuel Installations.

THIS book, by Ronald Grierson, M.I.E.E., M.I.MECH.E., sets out the principles of domestic water heating and provides a critical analysis of current practice in the supply of hot water for domestic purposes.

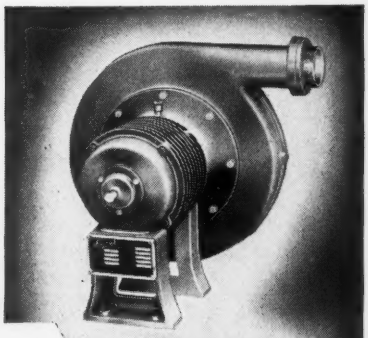
The author applies sound engineering principles to the design of water heating plant of the solid-fuel/electric type, thereby increasing efficiency and decreasing running costs. He deals mainly with the combination of an electric immersion heater and thermostat with a conventional hot-water storage tank, in conjunction with a coal- or coke-fired domestic water heater, this being arranged either as a "back-boiler" or as an independent unit. A suitably arranged installation of this type does, he contends, dispose of the widespread notion that "electric water heating is convenient but expensive."

25s. net. *By post 26s.*

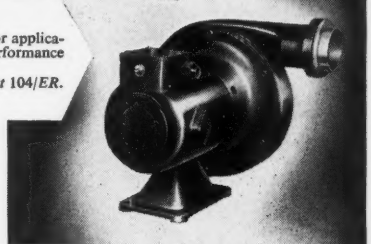
Obtainable from all booksellers or direct by post from: The Publishing Dept., Dorset House, Stamford St., London, S.E.1. Send for the list of titles available.

For high velocity SUCTION & BLOWING

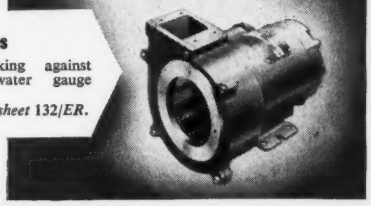
Multi-Stage
Greater pressure, or suction without increased impeller dia. Two and three stages available in some models.
Data sheet 132/*ER*.



Series Commutator
Many thousands in use for applications requiring high performance in small space.
Data sheet 104/*ER*.



Induction Motor Series
Great reliability working against comparatively high water gauge pressure.
Data sheet 132/*ER*.



Secomak REGD **STATAIR UNITS**
compact - adaptable
economical

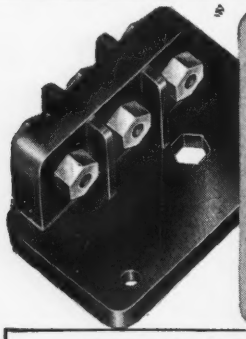
Hot Air
Range of heaters available for use with Secomak blowers giving air temperatures up to 700/800°.
Data sheet 130/*ER*.

★ **IMPELLER SIZES 2½—12 in. Dia.** ★ **AIR PRESSURES 0·3 in.—30 in. W.G.** ★ **VOLUMES 20—350 C.F.M.**

Secomak Statair Units are used for maintaining a pressure differential in glove boxes

For further information write to the manufacturers:—

SERVICE ELECTRIC CO. LTD. HONEYPOT LANE, STANMORE, MIDDX. Telephone: EDGware 5566-9
Manufacturing Electrical and Mechanical Engineers. Contractors to Admiralty and M.O.S. A.I.D. Approved.

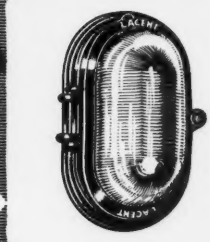


Quality PLASTIC MOULDINGS *with Service*

Consult SOUPLEX Limited
WESTGATE · MORECAMBE Phone 1717/8/9

CONTACT
DONOVAN
FOR ALL ELECTRICAL WHOLESALE SUPPLIES

INDUSTRIAL LIGHTING FITTINGS



THE DONOVAN ELECTRICAL CO · LTD
WHOLESALING DIVISION
Granville St · Birmingham 1 · *Tel: MIDland 5683 (5 lines)*

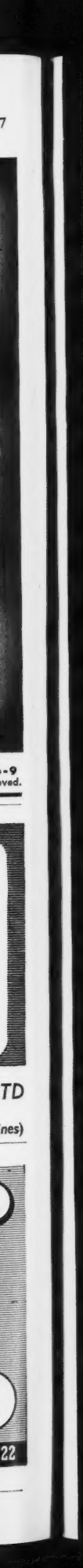
WASHERS LTD.

93 IRVING STREET
BIRMINGHAM 15
MIDLAND 1423

Dynamometer Test Rigs

CITY ELECTRICAL LONDON
EMERALD STREET, LONDON, W.C.1. HOLBORN 9722

Published by ELECTRICAL REVIEW PUBLICATIONS LTD., at Dorset House, Stamford Street, London, S.E.1
and printed in Great Britain at THE CHAPEL RIVER PRESS, Andover, Hants.



I like to be a big fish . . .

"I like my suppliers to regard me as one of their important customers. That's why I deal with the medium-sized firms."

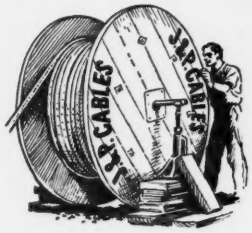
"Like J. & P?"

"Yes, exactly! They are big enough to tackle any electrical job but they are not too big to give me personal attention."

"That way you probably get better service."

"I certainly do."

THE RIGHT-SIZED FIRM FOR YOU

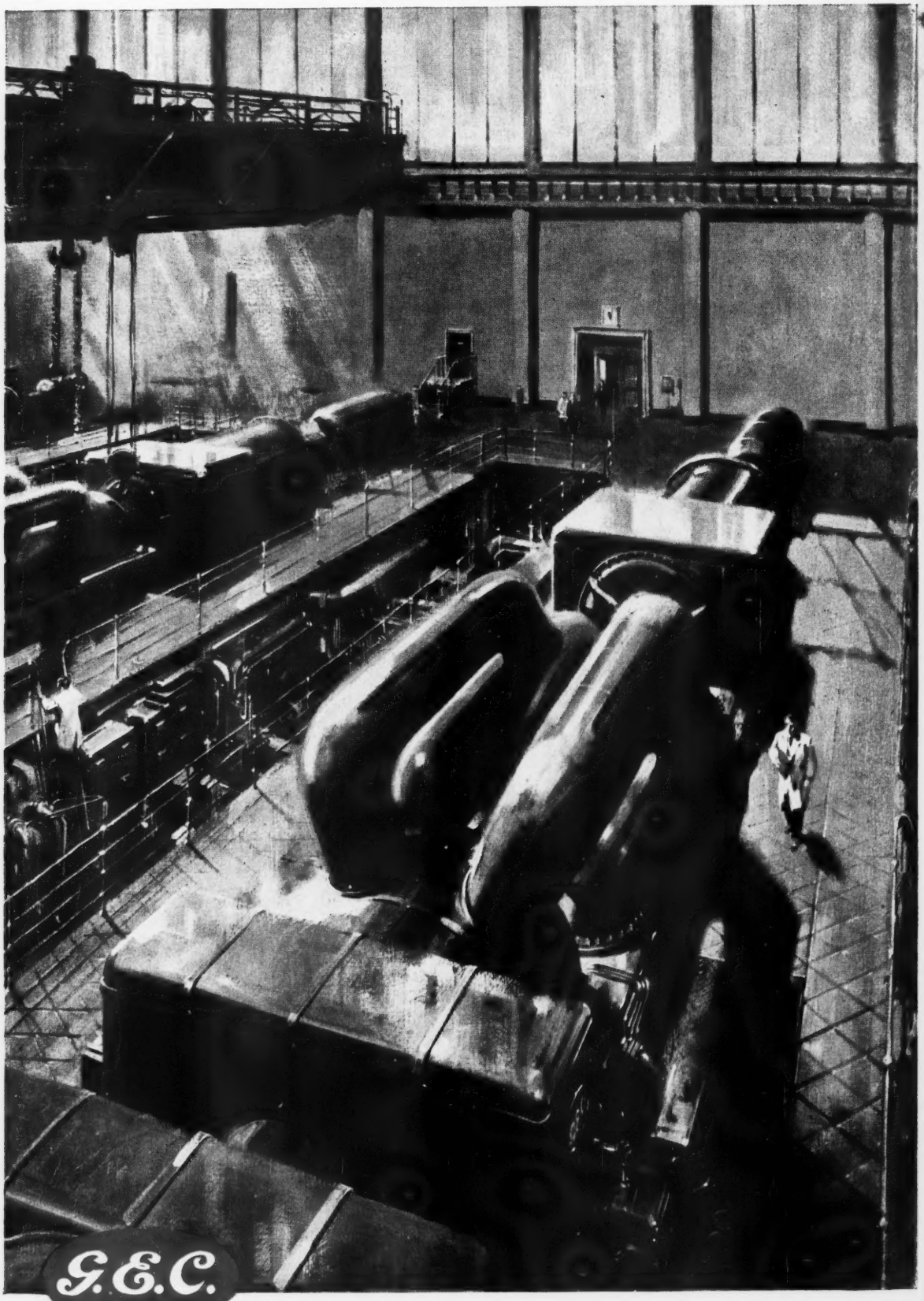


J. & P. manufacture cables, transformers, switchgear, capacitors, etc., and undertake electrification schemes for many of the largest industrial concerns in this country and overseas.
They have been in the business since 1875. But they still retain that regard for the individual customer that only the smaller firms can have.

JOHNSON & PHILLIPS

A Power in the Electrical World

JOHNSON & PHILLIPS LTD · CHARLTON · LONDON S.E.7



THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2